THIRD SERIES VOL 54 NUMBER 11 AUGUST 1947

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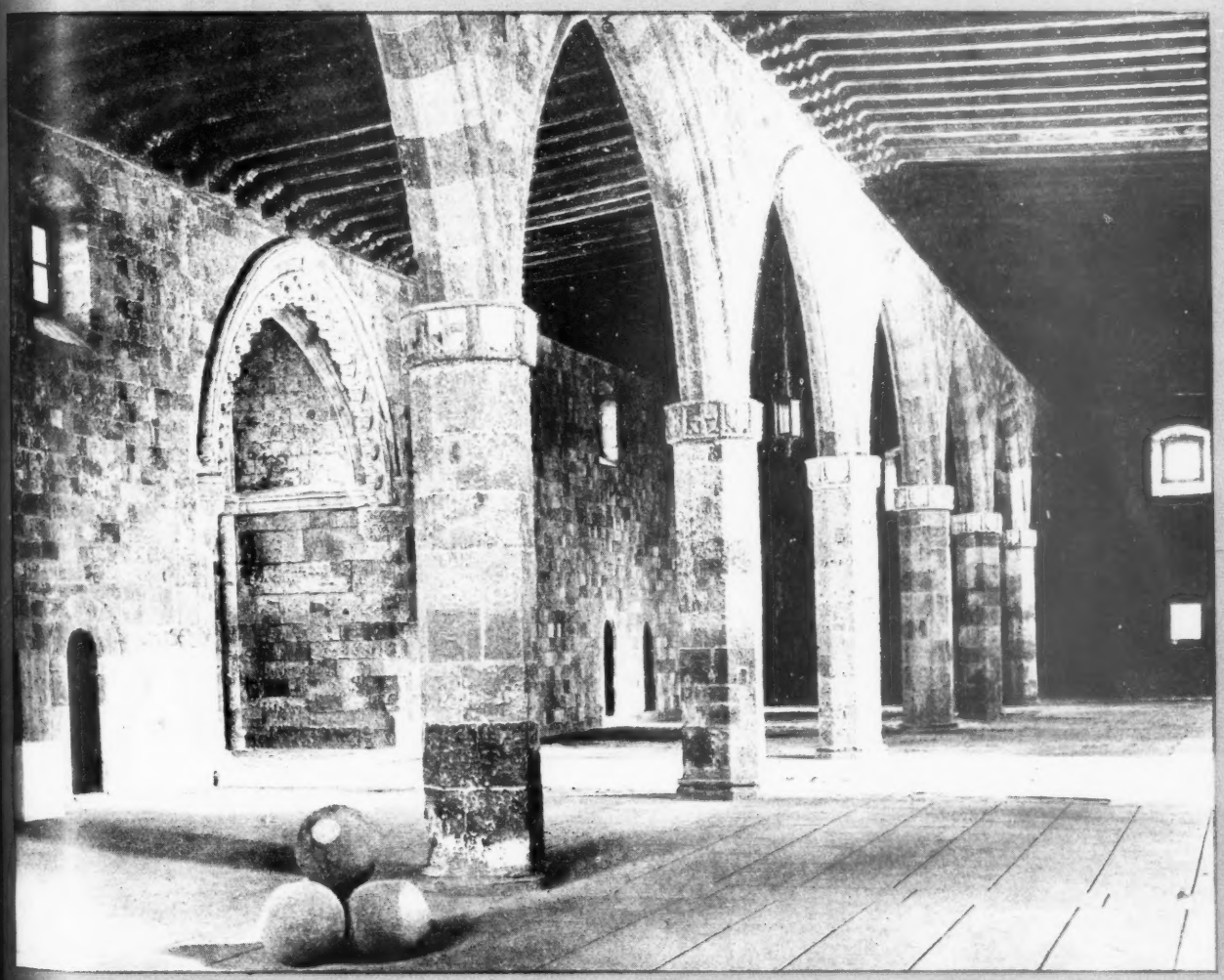

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THE JOURNAL OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

THIRD SERIES VOL 54 NUMBER 11 : AUGUST 1947 : 66 PORTLAND PLACE LONDON W1 : TWO SHILLINGS & SIXPENCE

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Lectures on Post-War School Planning and Construction

It has now been decided that the special course of lectures on School Planning and Construction to be held at the R.I.B.A. will be confined to two days only, namely, Thursday 23 October and Friday 24 October. The lectures have been designed as a refresher course for architects; special attention will be paid to the requirements of the new Education Act and to the way in which these are likely to affect the work of the architect. An application form for tickets for the course and buffet tickets for refreshments will be found inserted in this issue. Members wishing to attend are asked to make early application for both sets of tickets as these will be issued in strict rotation. The programme is as follows:—

THURSDAY 23 OCTOBER

11 a.m. Chairman: Sir Lancelot Keay, K.B.E., President R.I.B.A.
Secondary Schools by Mr. Denis Clarke Hall [*F*].
Discussion.
1 p.m. Lunch.
2.30 p.m. Chairman: Sir Lancelot Keay, K.B.E., President R.I.B.A.
Address by the Rt. Hon. George Tomlinson, M.P., Minister of Education.
Nursery, Infant and Junior Schools by Mr. John Harrison [*A*].
Discussion.

FRIDAY 24 OCTOBER

10 a.m. Chairman: Mr. H. S. Goodhart-Rendel, M.A.Oxon., Past President.
Standard and Quality of Lighting by Mr. William Allen, B.Arch. [*A*].
Discussion.
11.30 a.m. *Heating and Ventilation* by Mr. C. C. Handisyde, A.A. Dip. [*A*].
Discussion.
1 p.m. Lunch.
2.30 p.m. Chairman: Sir Lancelot Keay, K.B.E., President R.I.B.A.
Acoustics by Mr. Hope Bagenal, D.C.M. [*F*].
Discussion.
4 p.m. *Use of Materials* by Mr. Robert Fitzmaurice, B.Sc.(Eng.), A.M.Inst.C.E. [*Hon. A*].
Discussion.

As mentioned in our last issue, there will be a small technical exhibition in the Foyer which will illustrate and supplement the points discussed during the course. The exhibition will also include illustrations of schools in foreign countries; America, Denmark, Sweden and Switzerland have already promised contributions, and it is expected that other countries will also be represented by examples of their post-war work.

Coventry Cathedral Competition

In the following letter, signed by the Secretary, R.I.B.A., and dated 16 July 1947, the views of the R.I.B.A. Council on the Report of Lord Harlech's Commission were set out.

Dear Sir,

At the last meeting of the Council of the Royal Institute of British Architects, held on the 8 July, reference was made to the reports in the Press of the recommendations made in the Report of Lord Harlech's Commission.

My Council welcome the proposal that a competition should be held under the R.I.B.A. regulations governing the promotion and conduct of architectural competitions. It was felt, however, that the recommendation that the new Cathedral should be built in the English Gothic tradition was too restrictive.

While it is appreciated that the new buildings should be related to the old so as to achieve a fine architectural composition, my Council feel that in view of the great conflict of opinion expressed in evidence before the Commission it would be in the general interest in this case not to impose any condition which might restrict the imagination of architects and thus imperil the benefit of an open competition and the obtaining of the best solution of this most difficult problem.

I am to ask that the views of my Council may be submitted to the Cathedral Committee.

Yours faithfully,
C. D. SPRAGG,
Secretary.

The Clerk,
Coventry Cathedral Council. 16 July 1947.

On 22 July a letter was received from the Clerk to the Cathedral Council stating that the original recommendation regarding the style and material of the proposed cathedral had been modified to read: 'The new cathedral should be built in good weathering red sandstone, the architect being free to make his own choice of style provided that the new cathedral is built in continuity and harmony with the tower and spire.'

A.B.S. Tombola at the Building Exhibition

Calls on the services of the Architects' Benevolent Society are continuous and all have never yet been adequately met. The A.B.S. never refuse a genuine appeal for help but cannot always meet a need as fully as they think the case warrants. To add to their funds the A.B.S. is organizing a Tombola in connection with the forthcoming Building Exhibition, through the courtesy of Mr. H. Greville Montgomery. This is being designed to follow the lines of the one held at the 1938 exhibition. For the benefit of those who do not know what a Tombola is, we should say that it is a prize draw in which everyone gets a present. In the A.B.S. Tombola you contribute one guinea and get a numbered receipt which entitles you to participate in the draw. You will be able to pay your guinea and get your receipt either at the R.I.B.A. before the exhibition opens, or at the exhibition itself. The whole of your guinea will go to the A.B.S. as a direct donation: there will be no deductions for expenses, as these are being borne by Mr. Greville Montgomery to whom the Council of the A.B.S. wish publicly to acknowledge their thanks.

One purpose of this notice is to ask for gifts which can be used as prizes. These should be something to do with architecture, the allied arts or with building; for example, pictures and books on architecture and related subjects, small sculptures, clocks, china, glass and items of household equipment; the pictures should be either framed or mounted. The organizers of the Tombola wish it to be understood that a Tombola is not a jumble sale; you are not invited to use it as a convenient dumping ground for junk, but to present objects of a kind which you yourself would like to have.

Please, therefore, look seriously at your possessions and decide which of them you would like to present to your Benevolent Society. You are especially asked not to delay doing this because the organizers want to know as soon as possible how many prizes will be available; the number of tickets sold and consequently the revenue to the A.B.S. will depend on this. Gifts should be brought or sent to the Secretary of the Architects' Benevolent Society, 66 Portland Place, W.1.

Mr. Greville Montgomery has kindly given a space in the gallery at Olympia in which the prizes will be on view. The draw will take place a day or two before the close of the Exhibition. In 1938 more than 300 prizes were presented and the organizers are hoping for a larger number this time resulting in a substantial addition to A.B.S. Funds.

Georgian Architecture in East Yorkshire

An Exhibition of measured drawings, architectural works, prints and photographs, of Georgian works extant or demolished in the East Riding of Yorkshire, was recently opened in the Mortimer Museum, Hull. It has been arranged by the Georgian Society for East Yorkshire. The Exhibition Committee have got together a representative collection showing a number of old buildings in Hull, Beverley, Bridlington, and the County districts, including many now demolished in the ancient High Street of Hull. Fortunately Wilberforce House, the birth place of William Wilberforce (now a Museum) and Maister House with a good open staircase, and delicate wrought ironwork and plasterwork, C.1744, still remain. All these old houses were formerly the residents of the merchants of the city. The little-known Trinity House, fortunately untouched by enemy bombing, is well illustrated, the Court Room, supposed to be by Sir William Chambers, is well worth seeing.

Most of the photographs in the Exhibition are by the National Buildings Record, who made a more or less complete survey of the old buildings in Hull and Beverley in 1940-41. Particular care has been taken to procure representative examples of the local styles, and wherever possible to identify local or other craftsmen. For example, the plasterwork of the ceiling of Beverley Guildhall, 1763, has been identified as the work of Courteeze, a Frenchman. A great many of the Georgian Houses in Beverley were the town or winter residences of the local gentry and have their internal details of a similar local type—this is particularly noticeable in staircases, but Norwood House, C.1760, has internal plasterwork in the same manner as the Guildhall, and is evidently the work of Courteeze. Most of the measured drawings shown are the work of former pupils of the Architectural School of the Hull College of Art, and those of the old houses in Bridlington by Mr. F. F. Johnson [*A*].

This Exhibition has perhaps more than local interest. Hull, which was badly bombed, is about to be reconstructed under a fine plan by Professor Sir Patrick Abercrombie who intends to preserve and to incorporate in the general scheme most of the buildings shown extant in this Exhibition. It is to be hoped that any new buildings in these areas will, while not necessarily slavish imitations, be erected in the character of the local tradition, and every allowance made for local architects and craftsmen to have full play in a design which would preserve the inviduality of the city.

R.I.B.A. Library

Hours: During September the Library hours of opening will be normal except that, as in previous years, it will close at 2 p.m. instead of 5 p.m.

Library Group: A preliminary meeting of those interested in the formation of a Library Group was held on 24 July. It was decided that a further meeting should be held on 21 October at 6 p.m. to discuss formal business and arrangements for holding an inaugural exhibition. Any who wish to join the Group (there is no necessity to be 'an expert' to do so) are asked to write to the Librarian.

Distribution of Books: Since 1938 the Library has accumulated a fairly large surplus stock of books, which, following the plan started some years ago, are to be offered to the Allied Societies, Architectural School Libraries, and U.N.E.S.C.O. A detailed list has been prepared, and will be sent to Librarians or secretaries who write for it.

The Royal Fine Art Commission

The post of Secretary of the Royal Fine Art Commission has become vacant on the resignation of Mr. A. B. Knapp-Fisher [*F*], who has been Secretary since 1944. Pressure of work in Mr. Knapp-Fisher's own practice has made his resignation necessary. Applications for the post are invited from men and women. Candidates must possess administrative ability and a comprehensive knowledge of the fine arts, especially of architecture. The salary is £1,500 a year for a man, slightly less for a woman. Particulars and an application form may be had from the Secretary, Civil Service Commission, Burlington Gardens, W.1, quoting No. 1971. The latest date is 30 September.

The Battle of Britain Memorial

We regret that in our account of the Battle of Britain Memorial Chapel published in the July JOURNAL the design of the silverwork was incorrectly attributed. The silver altar rail, altar cross, candlesticks and candelabra were the result of collaboration between Professor A. E. Richardson [*F*] and Mr. J. Seymour Lindsay.

Advice to Young Members

The Council of the R.I.B.A. has approved a proposal to set up an Advisory Panel to furnish advice to younger members of the profession in London who choose to apply to the Secretary for confidential guidance on the question of entering into private practice. The Allied Societies are also being invited to set up panels for the purpose in their respective areas.

On the Cover

The Hall in the Palace of the Knights of St. John, Rhodes, photographed by F. Hepner, Ph.D., historian and architectural photographer.

A Form of Control of Building Development in Terms of Daylighting*

By William Allen, B.Arch. [*A*], of the Department of Scientific and Industrial Research, Building Research Station, and David Crompton, A.A. Dip., A.M.T.P.I. [*A*], of the Research Division, Ministry of Town and Country Planning

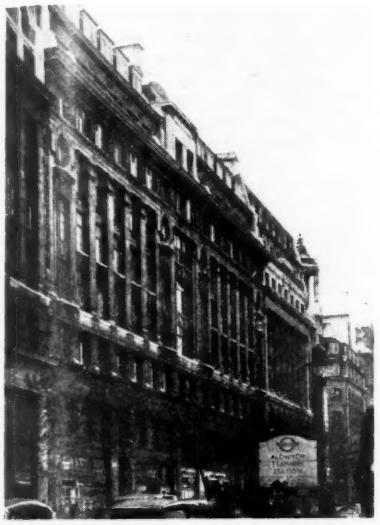

Fig. 1: A typical, relatively recent development in London, restricted mainly by the height to the cornice, overall height, and an angle of set-back above the cornice line. Light wells are formed in the body of the building

Fig. 2: A cross-section through buildings similar to Fig. 1

1. Introduction

AT THE present time the construction of buildings on a site in a built-up area in this country is usually controlled by limiting the proportion of the site which can be covered at various levels above ground, by limitations on the overall height, and by specifying an angle at which buildings must be set back above a certain height. The limits of height and set-back form a virtual envelope within which a building must be confined.

If demands for accommodation are maintained in a given district for longish periods, the envelopes tend to become filled to capacity, and accordingly the streets become lined with an array of buildings extending to the full permitted height. A typical development of this kind is illustrated in Fig. 1, and a sort of cross-section through such buildings is shown in Fig. 2, conveniently (for the present purpose) exposed by bombing. Obviously in conditions like these any direct daylight reaching the lower floors of buildings is going to arrive at so steep an angle that its depth of penetration will be strictly limited; and this is a general condition of the central districts of most cities in this and many other countries. The daylighting is usually poor and often bad.

It appears that this state of affairs is widely regarded as natural and inevitable—that there is a direct conflict between, on the one hand, the demands for high buildings to provide more floor area, and on the other the desire for more light, which is assumed to require low buildings. We know now that this is not the case, and that with certain kinds of development we can have relatively high floor-space indices (Note 1) and relatively good lighting at the same time. Waldram demonstrated this effectively some years ago in connection with the design for the London Passenger Transport Board building at 55 Broadway, London, where the choice of a cruciform plan in place of the more orthodox form with light wells enabled much better lighting to be obtained (Reference 1). More recently, cruciform plans and other plan-forms of what are generally called the 'open' type (such as the 'T', the 'L', the 'Y' and the independent thin rectangle) have been given a closer study which has provided a comparative measure of their usefulness in giving good daylighting along with high densities (References 2, 3, 4, 5 and 6).

These studies have established certain general principles of design, the architectural application of which can be visualized relatively easily. On the other hand it is less easy to see how to define requirements in any precise way which would enable suitable planning restrictions to be laid down to embody them. Again it is relatively easy to see how the ideas can be used on large, open sites, but not so easy on the small sites which are more typical of urban districts. These are two critical points which have to be examined before any general application of the principles can be made, and they form the main subjects of the present study.

2. The General Ideas of Daylight Analysis

For our present purpose we are concerned mainly with direct daylight. Reflected daylight is neglected here largely because it complicates the study without adding significant advantages, and because it is in any case mainly dependent on the direct daylight. The amount of direct daylight which will be found at any particular point in a room depends almost entirely on the size of any patch of sky which can be seen from the point; and this in turn is defined by the top and sides of the windows and by the skyline of the obstructing buildings. Since the shape and size of windows and also the shape and size of the obstruction can be varied we have two main variables in the problem, but of these only the obstruction will concern us here. It will be necessary therefore to make an assumption about the size of the window, though we can leave this for a moment.

The actual intensity of daylight, as of any other kind of light, can, of course, be measured directly, but because it depends on the brightness of the sky it will vary continuously and it is necessary therefore for design purposes either to make assumptions about the brightness of the sky or to compute in terms of the proportion of daylight which will reach any given point in a building. The latter is the established method in Great Britain and the unit used is the daylight factor, defined as the ratio of the illumination (usually on a horizontal plane) at a selected point indoors to the illumination found outdoors at the same moment under an unobstructed sky (Note 2). Thus a daylight factor of 1 per cent at some point indoors is taken to mean that the illumination there at any moment is 1 per cent of the total illumination available outdoors. For the purpose of computing daylight factors the assumption is made that the sky is equally bright in all parts, and although this is never precisely true, it is nearly enough true on the kind of day when it matters most, namely when the sky is overcast and the illumination generally is low. If a designer wishes to know the actual intensities which will probably be provided at various times of the year by any given daylight factor, the data is available (Reference 5).

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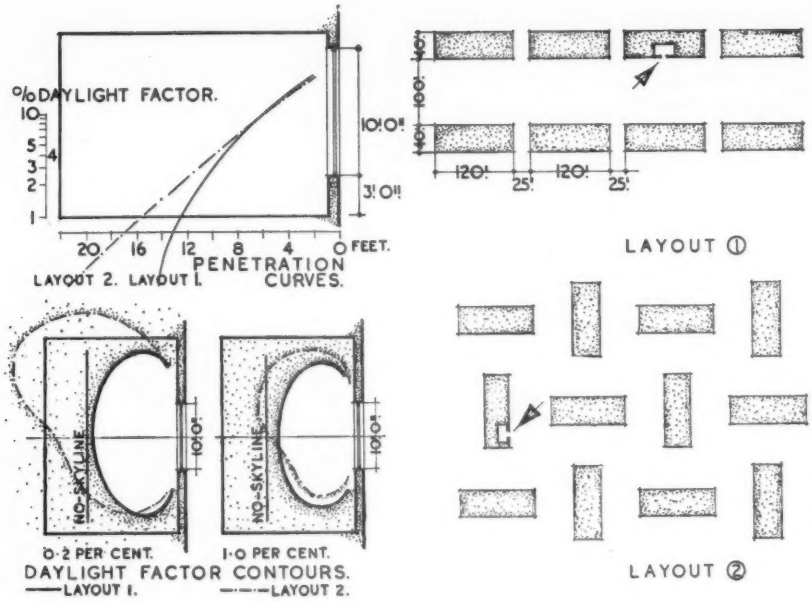

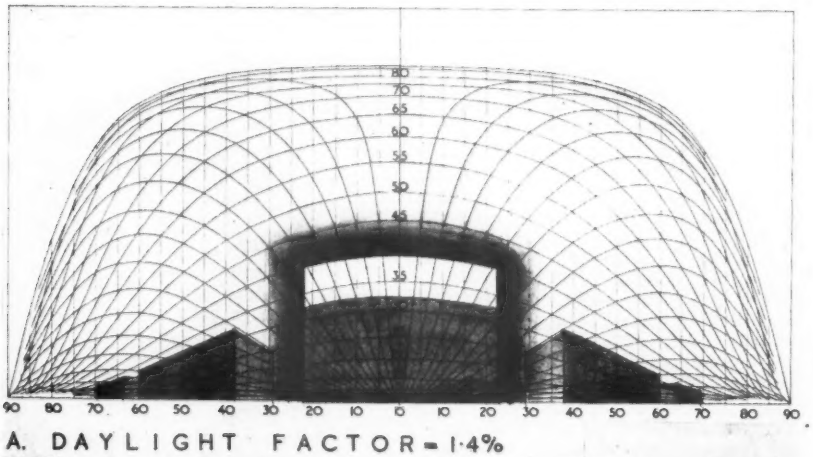

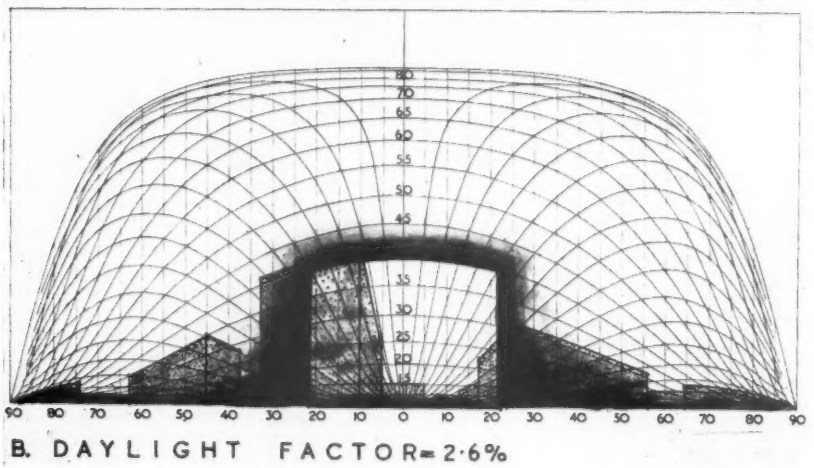

Fig. 3: Alternative type layouts and the comparative daylighting provided. The no-sky line shown on the room plans refers to the limiting depth of daylight penetration with layout 1; with layout 2 the no-sky line would be far outside the room. The daylight factor scale for the penetration curves is logarithmic

3. The Method of Computation for the Present Study

Several methods of computing daylight factors are available (References 5 and 7). For the present purpose an accurate graphical method seemed most suitable, and use was therefore made of the Waldram diagram in the modified form devised by its author to allow for loss of light on passing through vertical glazing (Reference 8). The diagram is a specially constructed reticule representing one-half the hemisphere of sky divided into zones, and the web is such that equal areas anywhere on it represent patches of sky making equal contributions to the illumination of a horizontal plane. By means of angular measurement, vertically and horizontally, the window and the obstructing sky-line as viewed from a selected reference point in the working plane can be set out on the diagram. The patch of sky visible through the window then becomes apparent and its area can be measured. The ratio of this area to that of twice the diagram is the daylight factor. The modified form of the diagram is copyrighted and is used here by permission of its author.

4. Assumptions for Comparative Analysis

It has been noted that for the present purpose it is necessary to agree upon the size of window openings to be assumed in the buildings under examination. We are concerned here with buildings particularly for office accommodation in urban districts, and our interest will be restricted to the ground floor rooms of such buildings, since these are often the worst cases. The choice of a reasonable size of window is debatable in detail, but consideration of common practice led the Building Research Station some time ago to standardize upon windows 10 ft. square with the sill at working plane level (assumed to be 2 ft. 9 in. above the floor), and separated by piers 3 ft. wide. This results in a glass area of the order of 50 per cent of the wall area. It is thought that this is an appropriate basis for the present investigation.

It is also necessary for purposes of comparison to agree upon the standard of lighting to be provided in obstructed buildings. At present no authoritative standard of daylighting has been formulated for office buildings and other commercial types, but the Committee of the Building Research Board on 'The Lighting of Buildings' had the matter under review at one time, and

Fig. 4: Waldram diagrams of the views through the two windows indicated on the two respective layouts of Fig. 3. The windows are 10 ft. square, and are viewed from the working plane at a depth of 12 ft. 0 in. The outline of the window and buildings outside has been emphasized by a grey wash

drawing upon the discussions which took place the assumption has been made that a reasonable standard would be the provision of a daylight factor of 1 per cent at a distance of 12 ft. inward from the outer walls, the object being partly to ensure coverage for two rows of standard office desks. This seems reasonable and in the absence of any other criterion it has been used for the present study. Attention should be drawn to one point about this standard which may not be obvious. The depth of 12 ft. would be measured from the outer face of the wall, because otherwise the variable wall thickness introduces difficult but relatively unimportant complexities.

5. The Influence of the Shape of the Skyline

The previous studies (References 4 and 6) have shown that important differences in daylighting are associated with various forms and arrangements of buildings. These differences depend upon the character of the skyline as seen from the lower floors of the buildings. The main point can be demonstrated by an example. Suppose that a number of buildings of uniform height are arranged so as to form virtually continuous parallel lines as shown in the first layout in Fig. 3. The direct daylight provided in ground floor rooms will then have the general characteristic that at points successively inward from the window its intensity falls off relatively rapidly to a zero along a line in the working plane termed the no-sky line. This of course will normally be parallel to the window and to the obstructing buildings and is so called because it demarcates the part of the working plane from which no sky is visible. In practice it is often quite easy to see because of the contrast in brightness between the directly and indirectly lighted zones. The position of the line is determined graphically on a cross-section by drawing lines from the tops of the obstructing buildings through the head of the window to intersect the working plane. Typical daylight penetration curves and contours for a representative ground floor room obstructed by parallel buildings are shown in section and plan in Fig. 3.

Suppose now that every alternate building is turned at a right angle to its former position as in layout 2, Fig. 3. It is then discovered, as shown in the penetration curves on the figure, that values below 2 or 3 per cent are found much further back in the room than before. This is illustrated also by the contours shown in dotted lines in the room plans. The cause should be readily apparent from Fig. 4, where the views through a representative ground floor window for each type of layout are shown set out on a Waldram diagram. The obstructing buildings are represented on this kind of diagram rather as in a panoramic photograph, and the shape of the patch of sky which is visible through the window in each case is quite easily seen. The most significant point is the difference in the shape of the two patches of sky; when the buildings are parallel, the patch is a long, flat rectangle of which the lower edge in this case subtends uniformly an angle of about 32 degrees; but when the buildings are at right angles the skyline has a great serration which drops to an angle of 7 degrees at its lowest point. Thus in the second case parts of the sky subtend such low angles that the light can penetrate comparatively very deeply into rooms. For instance the no-sky line would be found about 16 ft. inside the room in the first case and about 90 ft. inside in the second.

This, in a sense, is an idealized case; but it has a general practical significance for the reason that the parallel arrangement represents the conditions usually found in cities today where the parallel sides of streets are lined with buildings to a considerable height, while the arrangement of units at right angles represents the so-called open plan forms, the cruciform, 'T', 'L', and so on. That is to say the comparison in the idealized case shown represents a general comparison between the 'open' and 'closed' forms of development; or at least it represents an important part of a comparison. It does not display one other valuable characteristic of the 'open' plan.

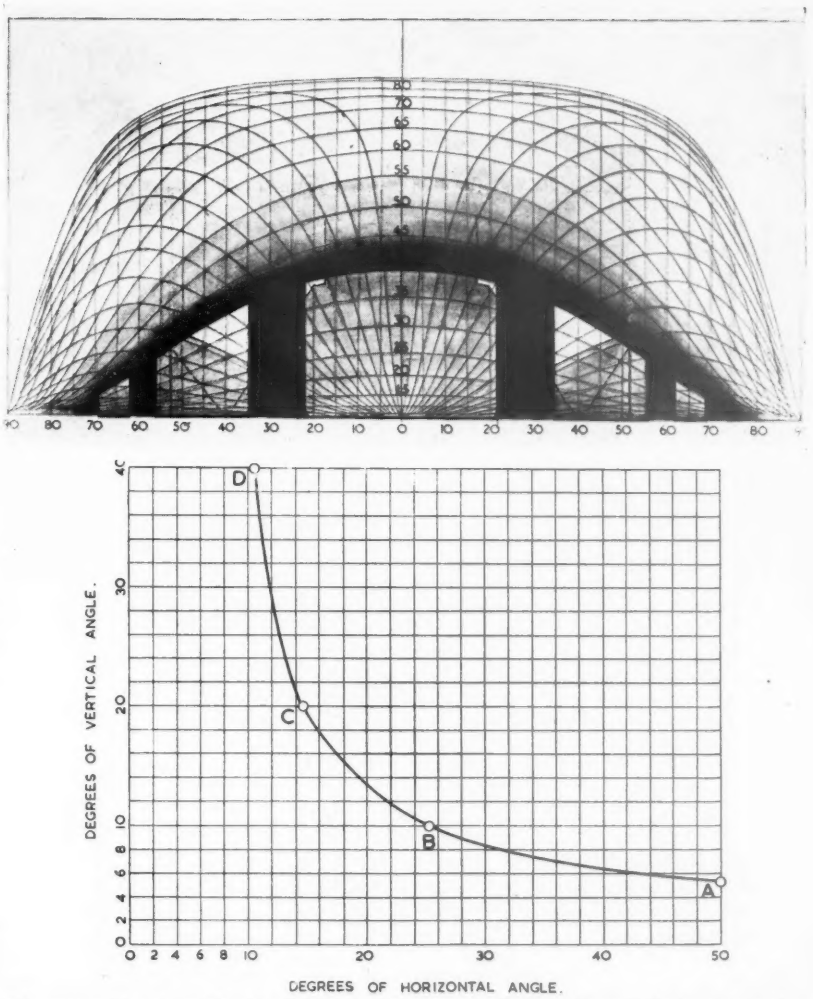

Fig. 5: Waldram diagram showing three alternative patches of sky giving a daylight factor of 1 per cent, and a graph indicating the various corresponding pairs of vertical and horizontal angles which describe patches of sky having a 1 per cent daylight factor

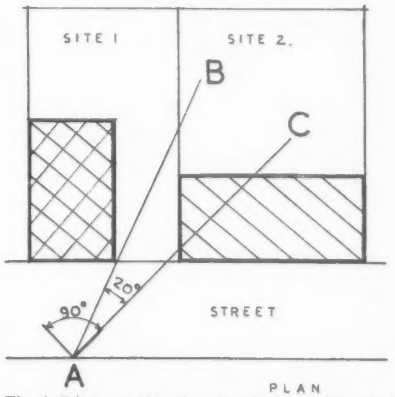

Fig. 6: Diagram plan showing the possibility that a view of the sky over one site (site 1) might be obstructed by a building on a neighbouring property

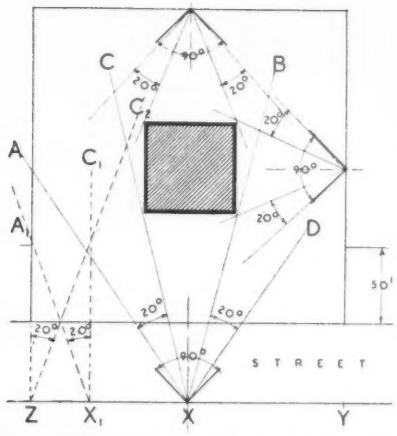

Fig. 7: Diagram plan showing how a centrally placed unit of indefinite height can permit adequate views of sky to either side

which is that the daylighting does not deteriorate nearly so rapidly with increasing density of development as it does in the case of the more orthodox 'closed' or parallel form.

6. The Form of Control

The idea of the serrated skyline is obviously at variance with the usual control in terms of a uniform height and angle of set-back. We will turn now to consider therefore ways in which this form of restriction might be modified. The first general requirement is to arrive at a way of describing patches of sky of different shapes having the same daylight factor value. A uniform angle of set-back for an obstruction leaves a patch of sky which, seen beneath a flat window head, has its top and bottom edges parallel, and its width is limited by the width of the window. On the other hand one can imagine a relatively narrow patch of sky which might be visible from top to bottom of a window which could provide the same daylight factor at a given point in a room, and which we could describe as having a certain angular width, with its bottom edge at an angular height of zero. Similarly we may visualize an infinite number of shapes between these extremes, each of which could give the same daylight factor, and if they are generally rectangular they could be described as having certain angular widths with corresponding angular heights. This is the idea which we will consider now.

The first point to establish is the size of patches of sky necessary to provide the required daylight factor of 1 per cent, 12 ft. from the outer wall. The upper edge of any patch will be defined by the angle to the window head (10 ft. above the working plane) as seen from the reference point in the room, and the width will be defined by the sides of the window. The angle subtended by the window head at the reference point is nearly enough 40 degrees, and if we set this out on the Waldram diagram we can draw beneath it any number of rectangular shapes representing patches of sky having a daylight factor value of 1 per cent. This is illustrated in Fig. 5. The heavy line at an elevation of 40 degrees defines the window height and beneath it are four areas, one of the greatest acceptable width (i.e. the width of the window), one of greatest height and two midway between the other two.

Having determined these patches (by trial and error), it is possible to represent them on a graph in terms of their angular width and height, and if a sufficient number of such patches is determined, it becomes possible to draw out on the graph a curve representing the full range of rectangular patches of sky which provide 1 per cent daylight factor under our specified conditions. There are slight variations in the size of the patches according to their actual position on the graph, but these are small within the present range and may be neglected. The curve shown in Fig. 5 was determined in this way.

For our present purposes it will be better to have, instead of the curve, a table describing patches of sky in convenient steps, and Table I has been prepared accordingly. In two cases the angular dimensions of the patches are rounded off to the nearest 5 degrees for practical convenience.

Table I
Angular Dimensions of Patches of Sky Subtending 1 per cent. d.f. at the Reference Point

Vertical Angle	Angular Width
5°	50°
10°	25°
15°	18° (20°)
20°	15°
40°	11° (10°)

The data in Table I have now to be modified in one other way to be in a form directly useful for design. As they stand, they describe the angular height of the visible patch of sky, but we require to know instead the angle of elevation of the lower edge of the patch, that is, to the obstruction which forms the lower edge. For this purpose the vertical angles in Table I are simply subtracted from the 40 degrees which is the angle to the top of the patch. Thus a patch of sky measuring 15 degrees downward from the window head corresponds to an obstruction subtending 25 degrees. On this basis Table I can then be re-stated as in Table II.

Table II
Alternative Couples of Angles Describing Suitable Breaks in the Sky-line

Vertical Angle of Obstruction	Angular Width of View of Sky
35°	50°
30°	25°
25°	20°
20°	15°
0–10°*	10°

* This figure should be 0 degrees, but the first 10 degrees or so of obstruction are not very significant and can reasonably be neglected. This is a relaxation which is very useful in practice

Table II is significant because we have now a description of a convenient series of differently shaped breaks in a sky-line

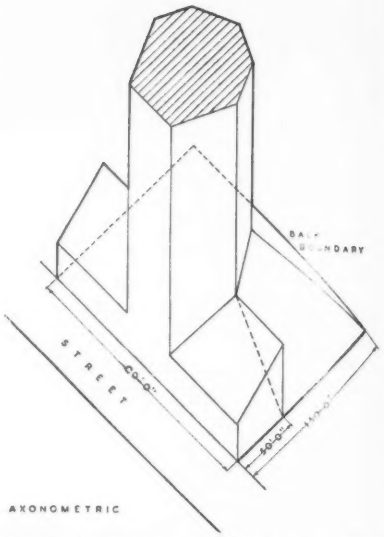

Fig. 8: An axonometric sketch of a typical complete building envelope as defined by angular restrictions of the kind described

which we may consider as modifications to the usual rule of setting-back according to a uniform angle, and we may assume in principle that we can arrange buildings any way we wish, and carry them to any height provided that from windows in other buildings nearby a patch of sky of one or other of the specified shapes can always be seen.

A further provision might be mentioned here, namely, that the patch must be visible within reasonable angular limits to either side of the normal view through the window. Otherwise the light might enter at such an angle as to illumine nothing but the side walls of the room. No detailed study of this has been made, but the Building Research Board's Committee on the Lighting of Buildings satisfied itself that no light coming from an angle greater than 45 degrees to either side of a window should be taken into consideration (Reference 5). In other words, the Committee adopted what we may term an 'acceptance angle' of 2×45 degrees $= 90$ degrees. This is probably nearly enough accurate for present purposes, and will be used here. In practice a number of special points arise which we may turn to consider now. Mostly these relate to the control of relatively small sites. If some of the points seem more complicated than one would wish, it should be noted that this reflects the fact that architecturally and functionally the small site is an unnatural arrangement; the division of land into small units in urban districts has its roots in economic ideas which do not take into account functional requirements. On comprehensive sites, the relation between buildings is, of course, much easier to adjust. The problems which arise along the various boundaries of an urban site will be examined in turn.

The Street Front. On the street front we are concerned with restricting the obstruc-

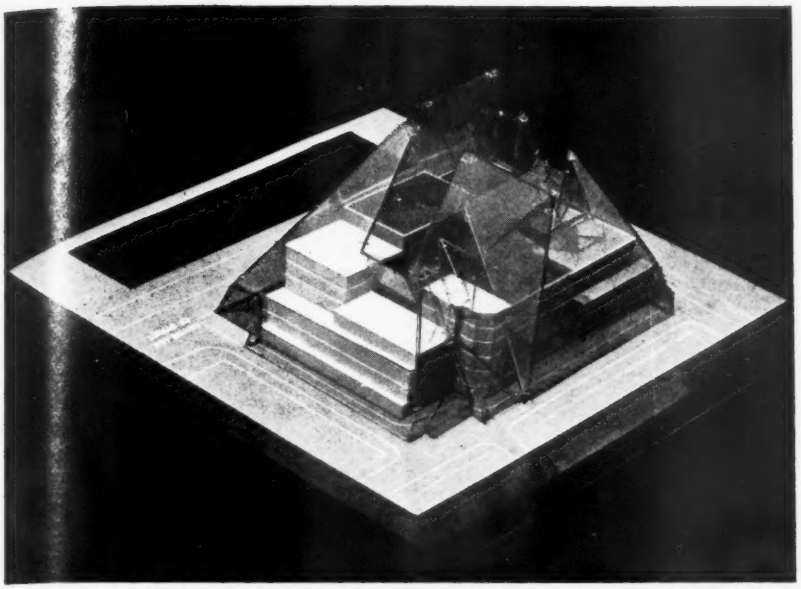

Fig. 9: A model showing a typical urban site sub-divided into four plots, each developed as a separate unit. Plot 1: Site area = 9,100 sq. ft. F.S. Index = 2.7. Plot 2: Site area = 10,500 sq. ft. F.S. Index = 2.4. Plot 3: Site area = 16,240 sq. ft. F.S. Index = 3.0. Plot 4: Site area = 17,160 sq. ft. F.S. Index = 2.5. Total Site area = 52,520 sq. ft. F.S. Index for whole site = 2.6 (basements not included). It will be seen that the smaller sites cannot conveniently be developed to obtain a F.S. Index of 3.0. Development is therefore correspondingly limited. Coverage on the site is high

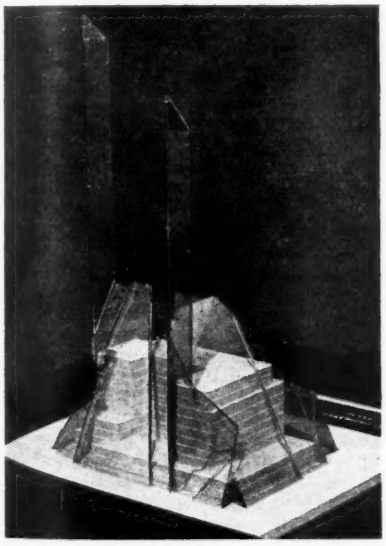

Fig. 10: This model shows the site developed as a whole, with development along the street frontages and with a courtyard at the back. Site area = 52,520 sq. ft. F. S. Index = 3.0. The transparent envelope indicates the extension of the possible development when the site is treated as a whole, but development along the street frontage prevents the fullest use of the alternative angles, and is restrictive

tion which a building may cause to other buildings opposite on the other side of the street An appropriate group of restrictions would be those shown in Table II (the angles being measured from the street boundary of the obstructed property), but we may make one simplification. The first item in the Table shows that when the vertical angle of set-back is 35 degrees, the patch of sky has to have an angular width of about 50 degrees. It may be more convenient to neglect the latter limit and say that if a uniform angle of set-back is to be used, it should be this angle of 35 degrees. Table II could then be modified for direct application to street front conditions as shown in Table III.

Table III
A Modification of Table II

Angle of Set-back	Angular Width of View of Sky
35°	Uniform set-back
30°	25°
25°	20°
20°	15°
10°	10°

Thus the proposed group of angular restrictions would include a uniform angle of set-back which would relate the group to previous practice, and a building could be designed, so far as the street frontage is concerned, either with a uniform and relatively high angle of set-back as at present, or with a lower angle of set-back along lengths sufficient to ensure a view of an appropriate angular width of sky within the desired acceptance angle from all opposite points on the opposite curtilage. Elsewhere the building could be raised to greater heights, unlimited by the present specification.

There is one slightly awkward point to consider. If a developer were only required to provide the view of a patch of sky over the frontage line of his property, he could provide it over one corner of his site, and a building might then be erected on an adjacent site which might entirely obstruct the intended view of the sky. The point is illustrated in Fig. 6. Here, on Site 1, the cross-hatched area indicates a part of the building of unrestricted height. From A on the opposite curtilage a patch of sky 20 degrees wide would be visible to one side of the higher part of the building, over the corner of the property. However, on Site 2 a building of some height might be erected as shown by the cross-hatched area, and this could nullify the usefulness of the restriction on Site 1. To prevent this, it would clearly be necessary to require that the view of the patch of sky be provided not over the street front, but over a line some distance back on the site. For a reason which will become clear in a moment it is suggested that this line be assumed to be 50 ft. back from the street front.

Side and Rear Boundary. Restrictions can be devised for the side boundary which will generally be similar to those on the street front, but there would be two important differences. First, it would be undesirable to have an angle of set-back required along the part of the side boundary nearest to the street, because a large V-shaped break would then occur in street façades at each property division. The question arises, therefore, how much of the side boundary should be free from a set-back restriction. The sensible course would appear to be to allow for a depth of building along the street frontage which could reasonably be lighted from the front and rear only, which would be, at most, about 50 ft. This carries us back to the point made a moment ago that patches of sky should be required to be visible over a line 50 ft. back from the street curtilage. If the two coincide, it will be appreciated that a required view of sky over the street façade of one property could not be obstructed by a building on an adjacent property.

The second difference arises this way. If an angle of set-back is imposed along the remainder of the side boundary and along the rear boundary, V-shaped valleys will be formed along the boundaries between the adjoining building envelopes. Now, wherever these valleys meet, as for instance where a side boundary intersects a rear boundary, windows of neighbouring buildings which face the intersection will have unexpectedly good views of sky. An examination of several sites of different shape and size suggested that in practice probably the majority of windows facing side and rear boundaries would benefit in this way, and it seems unnecessary therefore to impose along these boundaries set-back restrictions as rigorous as would otherwise be necessary to ensure the desired standard of illumination. Consequently, some *ad hoc* decision about alternate angles of set-back for side and rear boundaries has to be made, and after examining a number of cases the

conclusion was reached that the figures in Table IV would be practicable and reasonably equitable.

Table IV.
Angular Restrictions Applicable to Side and Rear Boundaries

Angle of Set-back	Angular Width
60°	Uniform set-back
50°	20°

It will be clear from the large differences between these angles and those of Table III that the effect of the junctions between the 'valleys' in opening up a view of the sky is quite important, and when taken into account in this way it permits a much greater bulk of building on a site than would be the case if the lower restrictions of Table III were to apply along the side and rear boundaries.

7. Example Developments

Two example developments will be given now to illustrate some of the points which have been examined.

Case I—Fig. 7 is a diagram plan showing how a centrally placed unit of indefinite height can permit adequate views of sky to either side. Horizontal angles AXC and BXD, in this case of 20 degrees, are drawn as shown from points along the boundary line YZ on the opposite side of the street, and the outer line of the angles passes on to the site to a depth of at least 50 ft. All the angles AXC may be drawn to the left of the building along the boundary YXZ and yet each will be found to remain within the acceptance angle of 90 degrees; likewise all the angles BXD may be drawn to the right.

Along the other three boundaries the same conditions can be made to apply, and it is thus found that the building occupies a space which would not interfere with the provision of the required amount of light along each boundary. The building itself could be carried therefore to an indefinite height, so far as the illumination of adjacent buildings is concerned. For this illustration the building has been placed centrally, but its position and shape could obviously be varied quite widely. The horizontal angle of 20 degrees is one of the angles shown both in Table III (street front) and Table IV (side and rear boundaries).

Case II—Fig. 7 only shows how a tower can be erected which would not interfere with the desired daylight for neighbouring sites. But much of the lower part of the site can also be filled in without causing undue obstruction, and Fig. 8 illustrates the form of building envelope which results on typical urban building sites. On the front boundary the development is conditioned by an angle of set-back of 25 degrees associated with a horizontal angle of 20 degrees (from Table III) and along the side and rear boundaries a horizontal angle of 20 degrees is associated with an angle of set-back of 50 degrees (Table IV). An exception applies, of course, along the 50 ft. of

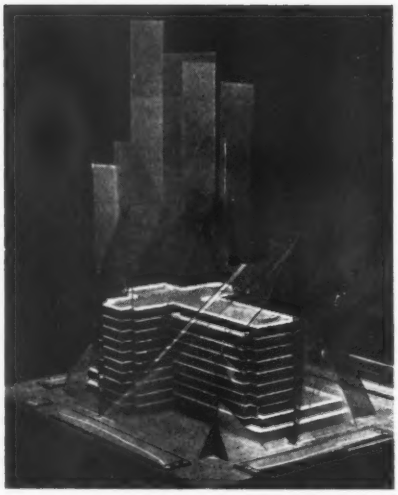

Fig. 11: This model also shows the site developed as a whole, but with an open plan. With development of this type, the use of alternative pairs of angles as described in the text permits portions of the 10-storey building to be placed on or near the building line, even in a narrow street. Height control exists only on those portions of the site through which the angles prescribed are drawn. Areas with no height control are indicated by vertical parts of the transparent envelope. It will be seen that a considerable part of the site remains free for a car park or other open space. Site area = 52,520 sq. ft. F.S. Index = 3.0 (basements not included)

site boundary nearest the street. The main characteristics of the envelope will be evident from the diagram, and the manner in which 'valleys' are formed between neighbouring buildings along their side and rear boundaries can be readily imagined.

Several examples have been worked out in model form by the Ministry of Town and Country Planning and are shown in Figs. 9, 10 and 11. The captions to the figures give details of the cases. In general the models show alternative developments on the same site in a central urban area. The buildings consist of shops and offices, and the maximum floor space index in any given case has been limited to 3.0 (Note 3). A maximum height of 100 ft. was also assumed, with average floor-to-floor dimensions of 10 ft. The total site area was 52,520 sq. ft., which is not unusual. The transparent planes around the models were made of plastic and represent one or other of the alternative pairs of angles defining various set-backs. On the street boundaries the angles of set-back read from the centreline of the street and not from the opposite curtilage as assumed elsewhere in this paper. The angles are adjusted accordingly.

In two cases it will be observed that vertical planes are indicated by the plastic sheets; these represent areas where unrestricted height could be allowed according to the proposed form of restriction.

The figures given in connection with each model indicate one important generalization, which should be noted. On small sites or on

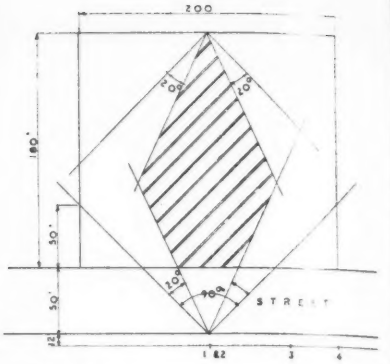

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Fig. 12: An example development

sites with a narrow dimension it is impossible to make full use of the envelopes, and the floor space indices are generally limited to about 2.5, as in Model 1. Larger sites developed suitably will not be appreciably restricted in density by the proposed control, since even without resorting to towers and exceptionally high parts (i.e. much above 100 ft.), floor space indices of 3.0-4.0 are easily obtained.

8. The Illumination Provided by the Control

No restrictions designed to be used in the very variable circumstances of practical development could produce a uniform standard of illumination, but they should ensure that a certain minimum—in this case the prescribed standard—is possible without making it necessary to resort to extreme measures in the obstructed buildings. Several cases were therefore examined to discover what range of values might be expected in practice.

General Assumptions—Analyses were made of the conditions on the ground floors of obstructed buildings, using windows of the size and spacing described earlier and computing daylight factors at a series of reference points along a line 12 ft. from the wall. The reference points lay opposite piers as well as windows. It was assumed also that contributions of light could be accepted through the several windows through which relevant patches of sky were visible. In practice an office which had only one window would therefore have less daylight than might be expected from this study, but it seems likely that in most cases where deeply penetrating daylight is most valuable the room will be large enough to require several windows.

Obstructing buildings were assumed to fill their envelopes completely.

Assumed Conditions on the Street Boundary—The following assumptions were made in respect of the street boundary conditions: (*a*) Street width to be 50 ft.; (*b*) plot width to be 200 ft. (It was found that on a site of this width the area on which buildings could be built to an unrestricted height was about as large as it could ever become unless the street width is increased, in which case the other dimensions increase correspondingly. This would

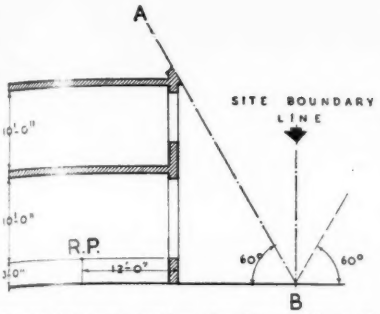

Fig. 13: Diagram section showing position of reference point assumed for studies of back and side boundaries

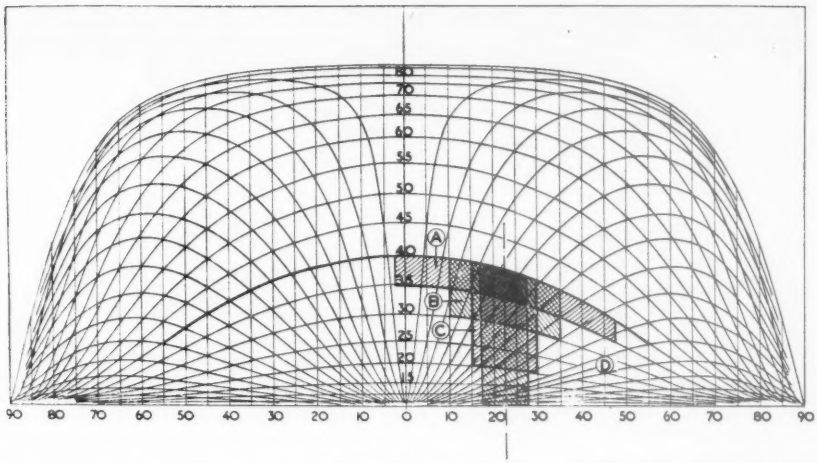

Fig. 14: Waldram diagram showing the view of the building envelope described, as seen through windows facing the rear boundary

be about the most obstructive type of case.) (*c*) Depth of plot to be 150 ft.

Consideration was given first to a case where the obstruction is defined by a horizontal angle of 20 degrees and a vertical angle of 25 degrees, as in previous examples. The plot is illustrated in Fig. 12, and a number of reference points are indicated on the opposite street front by the numbers 1 and 2 at the centre and 3 and 4 elsewhere. Positions 1 and 2 are central along the boundary, and are assumed to be opposite the centre of a window and opposite a pier respectively. Computed daylight factors were as follows: (1) 0.8 per cent d.f.; (2) 1.6 per cent d.f.

In these two computations it was strictly assumed that no areas of sky would be contributing light over neighbouring sites. This no doubt will be true on occasions, but in practice there will be a variety of circumstances, and it is worth considering what will happen in the common case where buildings on the neighbouring sites are restricted to the proposed uniform angle of set-back of 35 degrees. The daylight factors then increase as follows: (1) 1.45 per cent d.f.; (2) 2.25 per cent d.f.

In both circumstances the values at positions 3 and 4 were slightly lower than for 1 and 2, but were not much different from one another. Another form of development on the same plot was considered where the angle of set-back for the obstructing building was uniform at 35 degrees. There was then no appreciable difference between the daylight factors opposite the window and the pier, the values being in each case about 1.4 per cent. No contribution of light over neighbouring sites was accepted for this computation. Examination of the light at position 4 when the obstruction on the site opposite was uniformly high indicated a drop to 1.0 per cent, and at position 3 the value was a little higher. Again no contributions of light over neighbouring property were accepted.

Sites having both narrower and wider frontages were examined, and the following points were noted: (*a*) Narrower sites would show slightly higher values at central positions, where tower developments are employed, because of the necessarily reduced width of any towers which could be placed on the site. Below a certain width it becomes impracticable to use towers, and a uniform angle of set-back would be necessary. Ultimately the daylight factor values will tend to drop, owing to the restricted width of the patch of sky which can be assumed to be visible over the site. (*b*) On wider frontages wider towers can often be employed if sites are deep enough, and this will cause slightly lower daylight factors immediately opposite such towers. In general the lowest values will not be far short of the desired value of 1 per cent. Elsewhere along the boundary increased areas of sky should be visible.

On general consideration of these values it seems reasonable to conclude that the proposed restrictions serve the intended purpose along the street front and provide in addition a small safety factor in most cases.

Back and Side Boundaries—Before conditions on the back and side boundaries are examined, it is necessary to consider where a reference point and window can be assumed to lie, for it obviously cannot be directly upon the boundary. After some consideration the following course was adopted, illustrated in Fig. 13 as a cross-section through the boundary zone. A line A-B represents the angle of set-back, and it was assumed that the nearest approach which a building would usually make to the boundary would be represented by a two-storey portion lying within this angle. Normal floor heights were assumed as shown, and the resulting location of the reference point at the assumed depth of 12 ft. is indicated by the letters R.P.

On the back boundary, the site was assumed to be 150 ft. wide, and not 200 ft. as before. The angle of set-back from the rear boundary was 50 degrees, (with a corresponding angular width of 20 degrees), and from the side boundary 60 degrees (uniform angle). The typical view through a window facing the back boundary at its centre is shown in Fig. 14. The sloping lines on the figure represent the edges of the envelopes where the 'valleys' along side and rear boundaries meet. It will be seen that the 'valleys' are very important for the daylighting. At this point the daylight factor fell to 0.65 per cent, but opposite a pier in the central position the value is higher, and the values increase towards the ends of the boundary. The general levels are up to 1 per cent or more.

Consideration of other cases indicates that opposite wider sites values would be lower, because the valuable views of the sky where the 'valleys' occur will be further to either side. *Vice versa*, opposite narrow sites values will be higher. Where the depth of the site increases, a gradual decrease in daylight values can take place on the rear boundary because the actual heights of buildings on the obstructing site can be greater. Along the side boundary the worst-lighted windows will not be at the central positions but near the line across the site 50 ft. from the street where the part of the building which fronts on the street is allowed to rise vertically. The vertical building face at this point will restrict views of the sky for windows very close, and daylight factors will be decidedly below the desired value if the angle of set-back of the obstructing building is 60 degrees. If, however, this is decreased to 50 degrees (with the corresponding angular width of 20 degrees) the daylight factors rise to values of the order of 0.75 per cent. These computations were made for a site 150 ft. deep, as assumed previously. On sites of lesser depth or width values will increase, and on greater sites values will decrease slightly.

It will be clear from consideration of all these examples and from the sizes of sites examined that the proposed restrictions are in general adequate but that there are places where they do not ensure the assumed standard. It would be possible, of course, to modify them to provide the assumed standard at all points, but the additional complexity would not seem to be warranted. The example analysis on a site 200 ft. wide and 150 ft. deep is illustrated in Fig. 15, where approximate 1 per

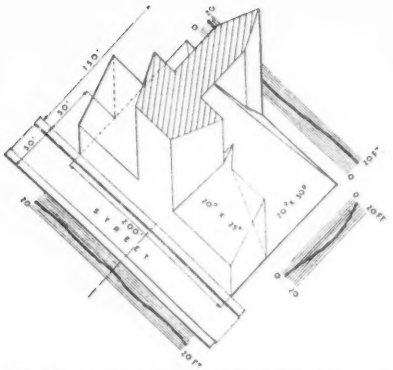

Fig. 15: 1 per cent daylight factor contours. Penetrations in feet. Maximum height assumed 100 ft. Axonometric diagram of a building envelope showing the depth of penetration of 1 per cent daylight factors possible along the various boundaries

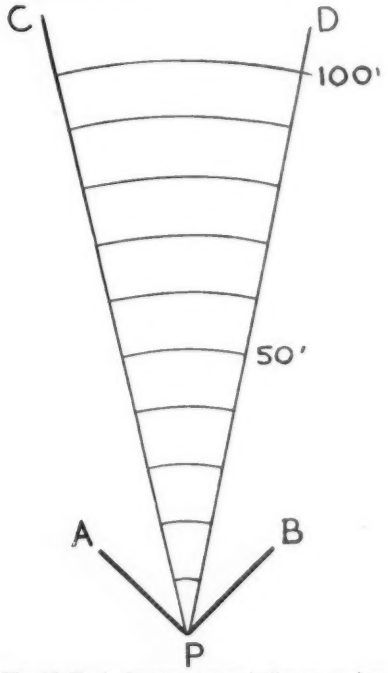

Fig. 16: Typical protractor or indicator to show the permitted height of building at any point in relation to any selected pair of angular restrictions

cent daylight factor contours are shown for rooms facing the site along all boundaries. The site itself is developed symmetrically about the main axis, according to the restrictions indicated on the figure. It shows more clearly here that standards of the order desired are possible along boundaries generally, and that the effect of the proposed restrictions is approximately similar on all sides of a site.

9. The Particular Case of Large Open Sites

Where a large area of land is held in one ownership and is to receive several buildings, a slightly different problem arises in determining the right relation between these buildings in terms of daylighting. Since there are no boundary lines between the buildings, the restrictions designed for side and rear boundaries will not apply. The restrictions designed for the street frontage could be applied however, and this would seem the sensible course. The angles would, of course, be measured from the base of the building in lieu of a boundary line.

When adjacent large island sites or large sites separated by streets are developed with buildings such as the cruciform and other open-plan types the main parts of the buildings, being central on the site, will be farther apart than was envisaged in the formulation of the proposed restrictions. That is to say, it was assumed in deciding upon the angles of set-back to be proposed that they would be measured from the boundary of the obstructed site, and that this would coincide with the base of the building, whereas the base of the obstructed building might actually be some distance back from the boundary. The result would, of course, be much better lighting for the obstructed building than was intended, because the angle to the obstruction would be lower, and we may therefore regard the proposed restrictions as being needlessly onerous in such a case so far as the obstructing building is concerned. It is difficult to see precisely how to cope generally and yet effectively with this very important point apart from dealing with each case on its merits as it arises. Perhaps a workable compromise would be to measure all angles of set-back from the centre of the street between the two boundaries. This would have the effect of permitting a block to go relatively higher when it is some distance back from the boundary, and therefore if the neighbouring building is also some distance back the resulting obstruction would be nearer to what was intended. On the other hand, if the neighbouring building is built at the edge of the street as originally envisaged it will be obstructed to a greater extent than was intended. This emphasizes the need to treat such cases on their merits.

10. A Simplification for Design and Administration

If the proposed control were adopted in practice a developer would have to test the boundaries of the site to see if the development complied with the limits of the alternative pairs of angles. A planning authority would have likewise to test a proposed design. A convenient method of doing this would be with a special protractor or indicator which, used in conjunction with block plan, would indicate the appropriate building height in different places. The protractors could be set up for each pair of angles in the following way (see Fig. 16). Draw CPD to form the desired horizontal angle (25 degrees in this case). On the line PD, mark off the distances from P required to allow various heights under the corresponding angle of set-back (20 degrees in this case), and then join the two radii PC and PD by arcs of circles. The protractor must, of course, be drawn to the scale of the block plan to be tested. The instrument is completed by drawing AP and BP symmetrically at 90 degrees, to correspond with the desired acceptance angle. These protractors have recently been described fully in a paper by G. T. Pound given to the Town Planning Institute. By means of such instruments, proposed developments may be quickly tested by placing point P at various places along the boundaries to see whether the heights of the buildings are in excess of the reading on the arcs of the protractor at any point. The protractor can be pivoted on point P until PA or PB lies along the boundary.

A Summary and Some General Remarks

The background against which this study should be viewed has been itself the subject of other papers (References 4 and 6), but a brief description may be useful here. The main point, of course, is the fact that the use of open-plan forms (such for instance as the cruciform), carried to a reasonable height on sites of reasonable size, makes it possible to have relatively high density developments with their concomitant advantages while providing at the same time much better daylighting than has been usual in urban districts. This is only a part of the picture, however. The open-plan developments make available a relatively high proportion of land which can be used for the relief of parking and traffic problems and for recreation. This, as well as the local needs of floor space, will affect the actual level of density to be employed. The safeguarding of daylighting on the lines described would enable the question of building density to be considered separately; a high density level could be permitted where it is desirable. Then, of course, there are points about the buildings themselves which, by comparison with a multiplicity of small buildings, offer more scope to designers and the firm economic advantage of a higher proportion of rentable space, owing to the more efficient employment of space for stairs, corridors and lavatories. Further, one notes that with developments of this character the risk of spreading fires becomes negligible, and that traffic noise from the streets is relieved by the increased space between buildings and the curb-line. These are factors as important often as daylighting, and the general group of ideas thus is seen to offer substantial increments of economic efficiency together with a considerable gain in safety and working amenity.

However, it is one thing to recognize such points, and quite another to administer building activity, so that it reaches such objectives. Existing forms of control, either with or without height restriction, are unsuitable and it is the purpose of the present study to provide a basis for modifying them along reliable lines. The modification proposed consists essentially of alternative angular limits to govern the shape of the building envelope on any site, in place of the usual uniform angle of set-back. A building envelope consequently is

able to take a great variety of shapes, all of which nevertheless ensure reasonable daylighting to all neighbouring buildings. The designer is thus permitted a maximum of freedom consistent with the protection of neighbouring buildings, and in this respect the proposal offers a very marked relaxation as compared with present controls. This calls for increased self-discipline on the part of designers if street architecture is to gain rather than lose by it. It is, of course, fundamentally desirable that large units of land be available to carry out developments of this kind. In respect of bomb-damaged areas the point now needs no discussion, but in other areas where land may remain in smaller units the proposed form of control automatically offers an incentive to amalgamation through the opportunity to secure thereby a higher floor space index. It is a significant characteristic of the proposal that the larger the sites the larger the proportion of floor space can become without prejudice to the daylighting. If one were to suggest a desirable minimum target for the general size of sites, it would perhaps be of the order of 200 ft. square, or about 1 acre, for it is upwards of that figure that really usefully higher densities of development become possible without prejudice to daylighting.

The application of these researches presupposes the principle of use-zoning, or grouping of like-users. But in addition to this, the control of total building density may need reconsideration in so far as the ideas discussed, if put into effect, would not put any definite check upon overall density where developers took advantage of the unlimited height made possible in places. Building density could be limited in various ways, but these are outside the scope of this paper to discuss.

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Note 1.—The floor space index is the ratio of total floor space to site area.

Note 2.—A daylight factor measurement includes reflected light. The usual computations such as are made here do not, and strictly speaking they are computations of 'sky factor' and not 'daylight factor'. The former term is not yet established in use, however, and the term daylight factor will therefore be used here.

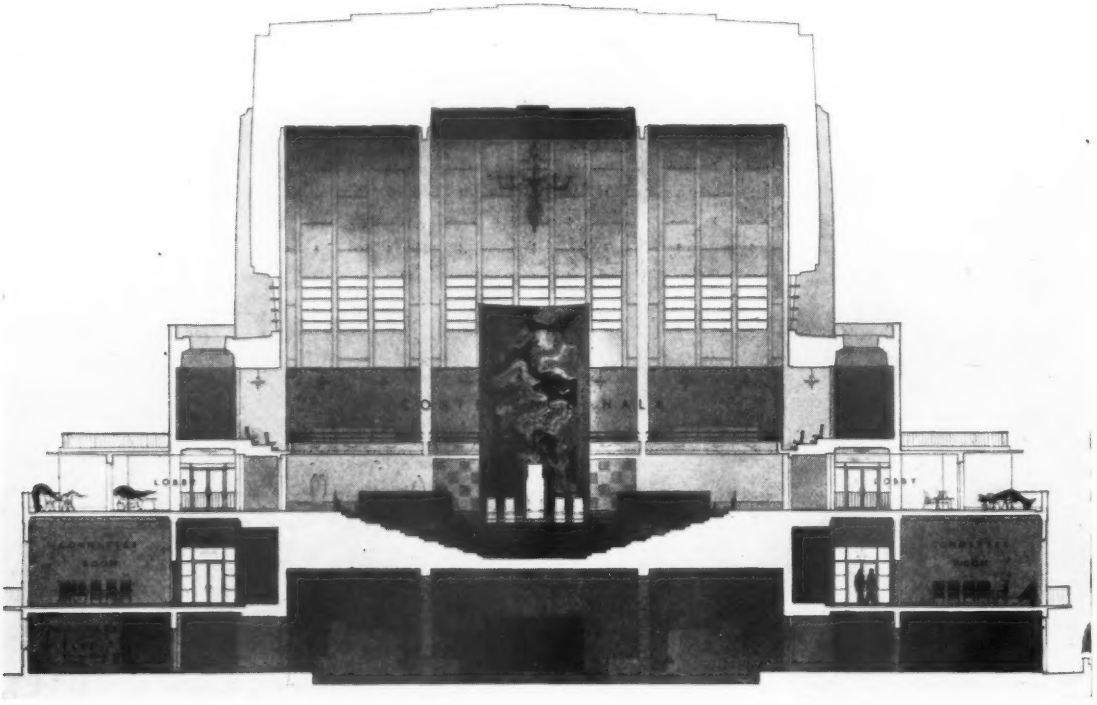
Note 3.—The floor space index is the ratio of floor area to site area. It is usual at present to find general floor space indices of 2–2.5 in urban areas in Britain, though this is exceeded locally.

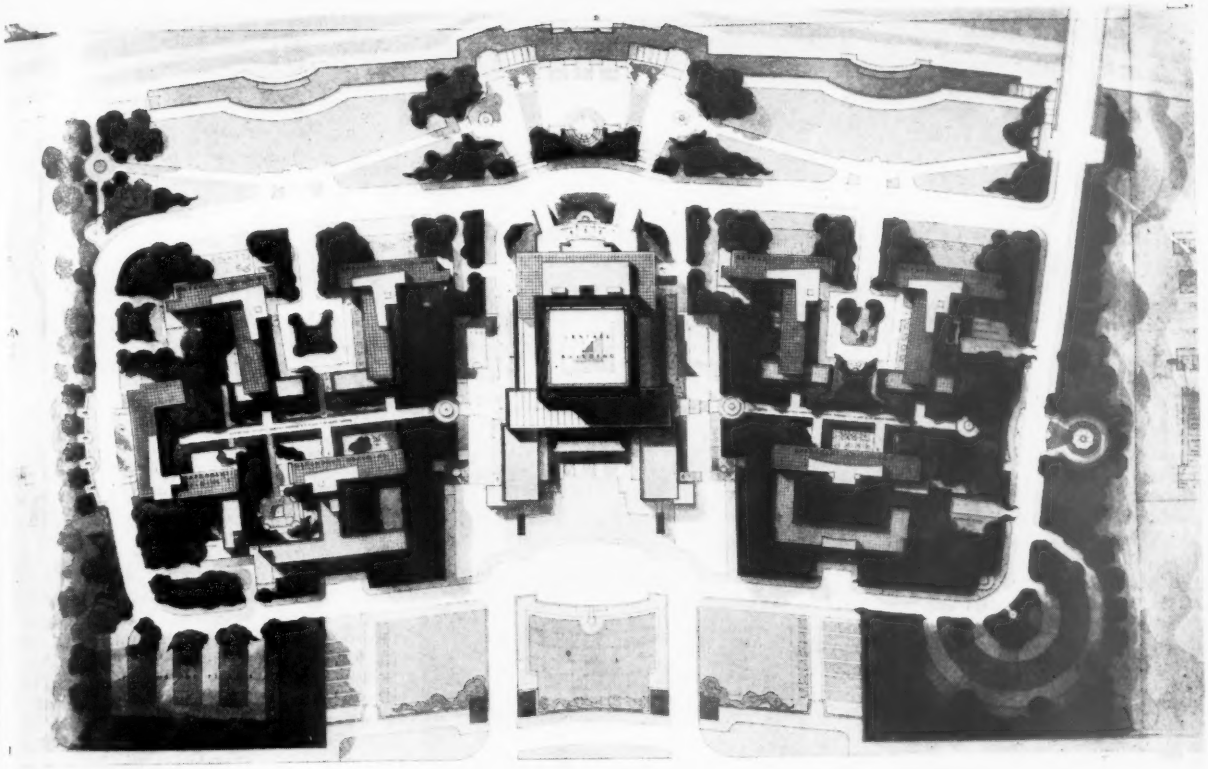
The Blackheath Road Police Section House (now temporary police station), Catherine Grove, Blackheath, S.E.10, for which the architects, Messrs. Horace Farquharson and Donald H. McMorran [*F/F*] have been awarded the R.I.B.A. London Architecture Bronze Medal

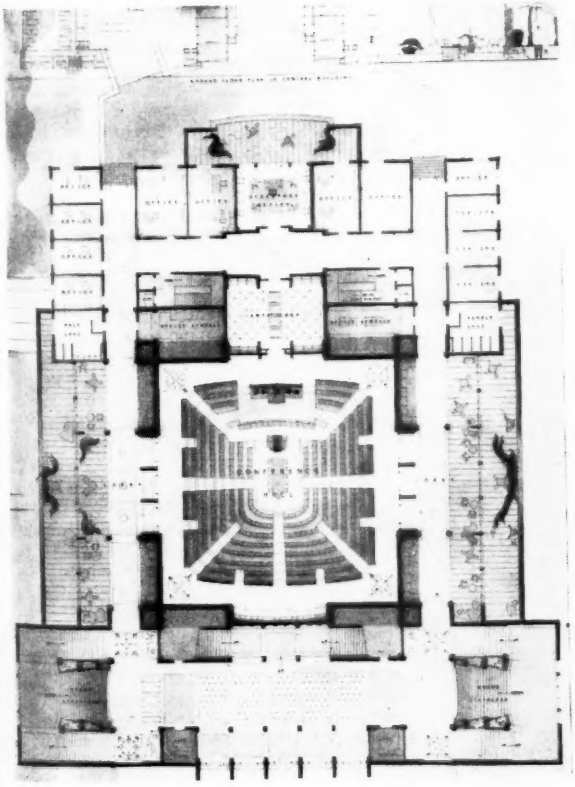
Rome Scholarship in Architecture 1947

The Winning Design by Richard Fraser [Student]

The photographs on these two pages are from the single large drawing of Mr. Fraser's design, for which he has been awarded the Rome Prize for 1947 by the Faculty of Architecture of the British School at Rome. The subject this year was a Commonwealth Centre on the banks of the Thames. Mr. Fraser is 29 years of age, and was educated at Daniel Stewart's College, Edinburgh, and entered the School of Architecture of the Edinburgh College of Art in 1935; he resumed his studies after six years' war service. The Rome Scholarship in Architecture is now provided for by an annual grant made to the British School at Rome by the R.I.B.A. Council.







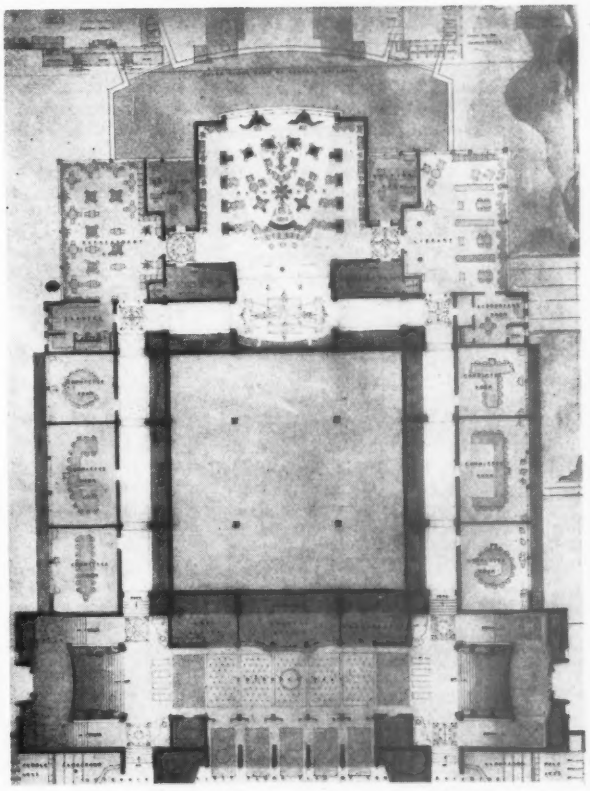


Fig. 2: The Legal Quays Project of 1796

George Dance the Younger

By Helen Rosenau, Ph.D.

WHEN George Dance dedicated his portrait drawings engraved by Daniell to Sir George Beaumont in 1808, this is what he wrote: 'Rousseau has entitled his compositions—"Les consolations des misères de ma vie"—I also can say with much truth of this work that it has proved to me a great relaxation from the severer studies and more laborious employment of my professional life'. He gives as his purpose to render 'faithful resemblances' of many of his friends. In these few words four salient traits in the architect's character are revealed—his modesty, his disappointments, his discouragement with life and his profound power for friendship. (Fig. 1.)

Indeed Dance's career is easily one which could lead to frustration. Born the son of George Dance the Elder, the architect of the Mansion House and Clerk of the City Works, on 20 March 1741, he succeeded to his father's office as 'Architect to the Corporation of London', and achieved considerable fame by the building of Newgate Prison (1770–78. Drawings are dated 1769 and as late as 1783). He visited Italy twice in 1761–2 and 1794. His marriage and family life seem to have been happily uneventful, except with regard to one relative referred to in a letter to Sir John Soane in 1798. The severe 'rustic' forms of the façades of Newgate Prison, the broad inner courtyards and the few single cells for the refractory presented at the time a norm of monumentality in civic architecture, as well as being adapted to the practical requirements of the day. A number of other official commissions followed, such as St. Luke's Hospital for Lunatics in 1782–4 and the 'Compter' in 1782–91, the latter taken down in 1854. He considerably altered his father's building of the Mansion House in 1806–13, and was also asked to erect country seats for numerous members of the nobility, such as Coleorton Hall (1802–8), Stratton Park (1803–4) and Ashburnham Place (1813–20). In 1806–13, when over 60 years of age, he built the Royal College of Surgeons in Lincoln's Inn Fields, together with James Lewis; his submitted designs for London Bridge with adjacent buildings failed to be executed (1796–99). (Figs. 2, 3, 5, 13.) At the time of his death on 14 January 1825, he was almost forgotten, a sick man living

Fig. 1: Self-Portrait 1790

in retirement. (The dates here given are checked with the help of Dance's drawings and include those of preliminary designs.) He was buried in St. Paul's Cathedral, the inscription giving a vivid expression of his character:

Here lie the Remains of
George Dance Esqre, R.A. & F.A.S.
This eminent Architect was
the last surviving Member
Of the Original Forty Royal Academicians.
Highly gifted by Nature, the
Superior powers of his Mind
commanded the admiration
and the excellence of his Heart
secured to him the Affections
of all who knew him.
After a long, useful and
Honorable life
he died, universally beloved
and respected,
on the 14th of January 1825,
in the 84th Year of his Age.

The Royal College of Surgeons is a characteristic work of Dance, combining the severe classical outline of a colonnaded portico with a niche and a domed hall in the interior. This combination of almost academic classical forms in the exterior with domes and 'polygon' halls and staircases within is a specific characteristic of George Dance's style. One of his compact designs for Coleorton Hall shows a polygonal layout for the whole of this country house in which circles and oval shapes are inserted. In a similar manner his work at the Guildhall in 1789 combines Classical and Gothic reminiscences with the emphasis on his domed Council Chamber of 1777, a contrast which is peculiarly his own. (Fig. 4.)

His pleasure in polygonal forms is also apparent in his octagonal plan for the timber building of St. Bartholomew the Less (*c.* 1789), as well as in his drawings for a stone building, perhaps of Stratton Park Church (1806). A fusion of Gothic and Classical forms is also seen in Ashburnham Place and Coleorton Hall, the façades of which combine Gothic medieval buttresses with an austere emphasis on the walls and plain windows, derived from the Renaissance, whilst the portico of Stratton Park belongs to the Classical tradition. It may indeed be said that in spite of a training in 'antique' traditions, which if he so desired he could put to good use, Dance's own taste led him to a synthesis of the Gothic tradition with the Classical, as well as to an individual interpretation of the domed hall of the Baroque. (Fig. 11.) Ornaments did not interest him as such, and those he uses, as, for example, in the 'Shakespeare Gallery' of 1789, have either a symbolic meaning like the lyre or are derived from forms of nature, as in the ammonites used for the volutes of the capitals. (Fig. 8.) But when no ornament is necessitated either for symbolic reasons or in order to enhance certain structural details, then Dance develops a style which is closely akin to modern building in his aversion against ornament and in his emphasis on revealing architectural form.

A sheet in the Print Room of the Victoria and Albert Museum embodies this combination: On the recto is found an academic tinted drawing of a façade in the style of Lord Burlington, whilst the verso consists of a pencil drawing revealing a phantasy, a sequence of vaulted halls. (Figs. 9, 12.) These drawings, which fail to display fully Dance's personal style with regard to ornament, should be dated about 1780, during the earlier phase of the architect's career.

In his designs for cottages he appears as a pupil of John Wood the Younger and his followers. The former's book on agricultural labourers' cottages was published in a

Above, Fig. 3: London Bridge, project of 1796.
Right, Fig. 4: View of the Council Chamber, Guildhall, as built by Dance

new edition' in 1792. Although these dwellings embody the very minimum of living space, they set a type which is still reflected in the 'semi-detached' suburban house. (Figs. 14, 15.)

Dance's importance in the development of English architecture is perhaps even more apparent in his designs with regard to town planning. Among these are four—the projected plan for the district of the Coliseum in Camden Town influenced by John Wood's architecture in Bath;* Finsbury Square (including a circular garden) some of the houses of which on the West side still follow his design and have been preserved; the layout for Alfred Place near Tottenham Court Road, the original houses having disappeared whilst the ground plan, with its two monumental crescents, is still clearly marked. (Fig. 6.) (1790–1814.) But the most important of his designs with regard to town planning is the development of symmetrical crescents on the two sides of the river, adjacent to London Bridge. These latter plans are clearly influenced by Roman fora and thus constitute a 'restitution' of the classical models, since the traditional forms have not been separated from their content.† The design for the approaches to London Bridge is known to us through Daniell's engraving. (Fig. 13.)

Dance's most ambitious plans were those related to the development of the Port of London. Here a process of 'denudation' has set in, the discarding of all ornament, and thus monumental architecture on a large scale is allowed to speak for itself. Dance

*This will shortly be discussed in a paper by Mr. John Summerson.
†We call 'Renaissance' a revival which uses certain forms without regard to their original meaning. 'Restitution' differs from simple copying in that it is the outcome of similar social situations which allow the taking over of the form together with the content from the past.

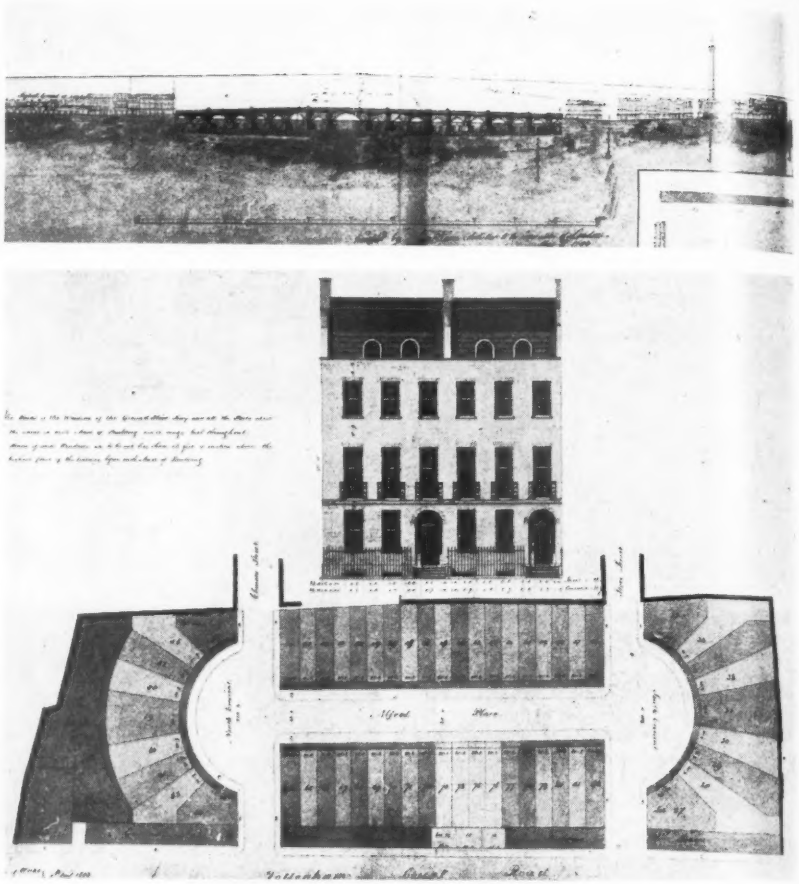
Top, Fig. 5: London Bridge, Project of 1799. Middle, Fig. 6: Alfred Place, Elevation and Plan, 1803. Below, Fig. 7: Guernsey Prison, Project Elevation and Plan, 1807

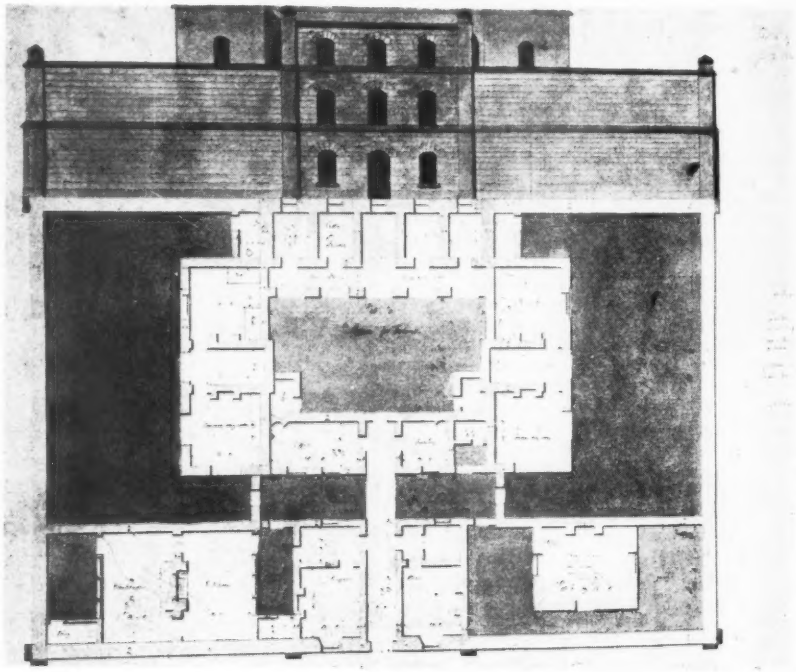
saw clearly that the Thames was not only an important waterway, but that the banks should contribute to the amenities of Londoners and be integrated on both sides of the river. His designs for the 'Legal Quays' of 1796, between London Bridge and the Tower, show not only the wharves and docks but also arched openings which would allow vessels to enter the dry docks. These openings afford the scale of his monumental composition, which embraces the approaches to London Bridge and the development of the river banks. The 'Monument' by Sir Christopher Wren was to have its counterpart in an obelisk on the South side of the Thames, and around these the above-mentioned crescents were projected. Thus the wharves and dwellings would have presented an architectural unity. (Figs. 2, 13.)

Dance's character, his emphasis on technical simplicity and efficiency, as opposed to the more traditional schemes for the environment of London Bridge, such as his father's, is seen in his plans. He envisages either a double bridge which would allow a continuous flow of traffic on the river or a bridge with one higher single arch serving the same purpose; in the same way his substitution of simple houses and wharves for the residential 'piazzas' suggested by his father,* should not be regarded only from a utilitarian point of view. These wharves express monumentality and the inherent beauty of good, functional design, and are in their austerity in advance of their period. Dance's project for London Bridge with the larger central arch built in stone—'the arch 100 ft. high in the clear above high water, the span being 300 ft.'—is formally more significant with regard to the future than Telford's 'Gothic' design for an iron bridge published in 1800. (With Dance's 'Variation of London Bridge upon an inclined Plane similar to that of Ludgate Hill' a radical change in the layout of the bridge's surroundings was intended.) Thus the traditional rather than the new material reveals the coming change of style towards simplicity. (Fig. 5.) Telford's St. Katherine Docks, built between 1824–28, are largely based on Dance's designs, although vertical pilaster strips have been added and the size and distribution of the windows altered.

Dance's attempt at a synthesis of Gothic and Classical forms, as emphasized by Inigo Jones and moulding the English tradition, has its antecedents not so much in Lord Burlington's as in Kent's work. Kent's two pyramids for an entrance to Holkham Hall are reflected in two designs by Dance in the Soane Museum for the entrance to a cemetery. His rustication of Newgate is also foreshadowed in Kent's compositions, whilst Dance is also indebted to Piranesi.

Dance's influence abroad may be gathered from the commission by Sir Benjamin





*Colonnades supporting the overhang of the upper floors had been planned by George Dance the Elder. Cf. G. Home: *London Bridge*, London, 1931, pl. opposite p. 320 and passim.

BRITISH GALLERY PALL MALL 1819
Erected by Alderman Boydell to exhibit Paintings
illustrating Shakespears plays, a folio edition
of which he was then publishing— The building is
now destroyed
C. J. Richardson

Fig. 8: Dance's façade of the Shakespeare Gallery of 1789, including a relief representing Shakespeare between Tragedy and Comedy, reminiscent of Sir Joshua Reynolds' rendering of Garrick between the two Muses (1769)

Thompson to supply plans for a 'Thatched Ice House' for the 'English Garden' in Munich in 1791.

When the German architect Schinkel visited this country in 1826 he was struck by the façades of private dwellings of a frontage of three to four windows, which in combination had the appearance of 'rows of palaces'. This type popularized by the Brothers Adam is given up by Dance, when he designs his frontages in forms of—it is true—uniform equality. This equality and emphasis on structure is a significant element in contemporary architecture in iron and concrete, and thus Dance may be considered one of the forerunners of the present age. How to develop individuality out of uniformity still remains a question which has been answered by Dance through a combination of elements, some derived from the past, some of his own composition, as those stressing the structural elements in the crescent, the polygon and the dome.

Dance's influence on his devoted pupil and friend Sir John Soane is to be traced rather in the emphasis on the structural forms of architecture than on ornamentation, as can be clearly seen by comparing their work in Pitzhanger Manor, Ealing, for example. It is characteristic that Soane speaks of Dance as 'my revered master'. To give only a few examples of the artistic relationship between Dance and Soane: Soane's façade of the Bank of England inspired by the Temple of Tivoli may be partly suggested by Dance's measured designs of this Temple (1761–2 and 1794). Soane's 'Rotunda' for the Bank of England is akin to Dance's Council Chamber for the Guildhall (1777) and even in Soane's more conventional classical projects for the House of Lords (*circa* 1796) one can see a reflection of one of Dance's drawings in the Victoria and Albert Museum, which reflects his style of about 1780. (Fig. 9.)

When estimating the place of Dance in the development of English architecture one has to realize his importance not so much in what he achieved as in what he projected. His was essentially the attitude of the civic architect, and that is perhaps the reason why he is today almost forgotten, whereas his contemporary colleagues, the Brothers Adam, John Nash, or Sir John Soane, who mostly built for the wealthy and powerful, have achieved enduring fame. The modesty of his character, his unassuming ways were reflected in his work. His deep interest in humanity and in the arts was shown in his numerous portraits, in the choice of his friends—mainly fellow-architects, artists and professional people, to the exclusion of politicians—and in the small figures which he liked to add to his architectural projects. He was neither interested in class nor rank; he therefore embraced equally the tasks of building the Royal College of Surgeons, Coleorton Hall, the alterations in St. Bartholomew's Hospital, squares or the Port or London Bridge. In that sense he had essentially the making of a people's architect, and this may be the reason for his not reaching full recognition in a period in which the incipient importance of the industrial revolution was not yet universally

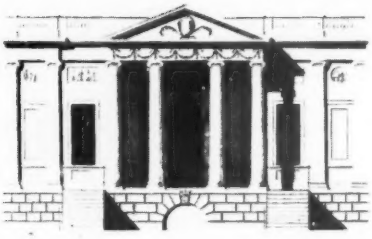


Fig. 9: Elevation of a mansion foreshadowing Stratton Park, *c.* 1780

recognized, and the aristocracy still played a predominant architectural rôle. It is at the present time that his work becomes of topical interest.

Among Dance's drawings in the Soane Museum there are a number of elaborate designs assembling on one large sheet his most important commissioned works. There are also found four printed sheets with the Coliseum plan re-used by Dance for further drawings, and we may therefore assume that like Lequeu, Boullée and Ledoux in France, George Dance planned the publication of an architectural work. Of these only Ledoux succeeded in his project. Dance's modesty and the timidity so apparent in his letters may have prevented him from writing fuller statements than short reports and papers, as his unassuming character also led him to abstain from his duties as a lecturer when professor at the Royal Academy.

In a letter to George Dance the Elder, of 1763, preserved in the Soane Museum, and informing him of the gold medal won for a design of an Academy of Arts in Parma, the son's filial and deep attachment to his father is apparent as well as his good-tempered modesty. Dance adds to the report of 1802 written by the Commissioners on the subject of the gaols in England that his recommendation for a better standard could only be implemented if ample financial means were forthcoming. In the same spirit of diffidence he writes in a letter of application (20 February 1800) to the Directors of the West India Docks: 'After having labour'd for several years past on the preparatory steps of this business it would ill become me now to enter into any sort of competition . . . . I am ready to bind myself not to make any charge or demand whatsoever nor require any Salary, but to content myself with such remuneration as the Directors may think my services deserve when the works are completed.' In spite of, or perhaps because of, this modesty Dance did not succeed in his application, although his designs are reflected in the wharves of the Katherine Docks mentioned above. He seems to have been equally unsuccessful in his project of 1807 for a prison in Guernsey which had shed the influence of Piranesi, substituting bare walls for rustica, and introducing the newly recommended single cells for sleeping (Fig. 7.)*

*I wish to thank Mr. G. W. Hoyt for information about Guernsey.

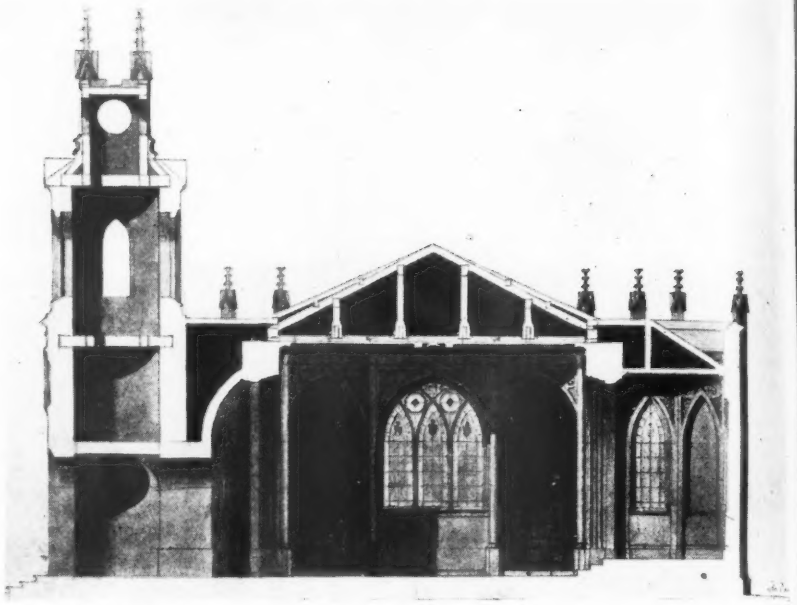


Fig. 10: Section of a Church, perhaps Stratton Park, 1806

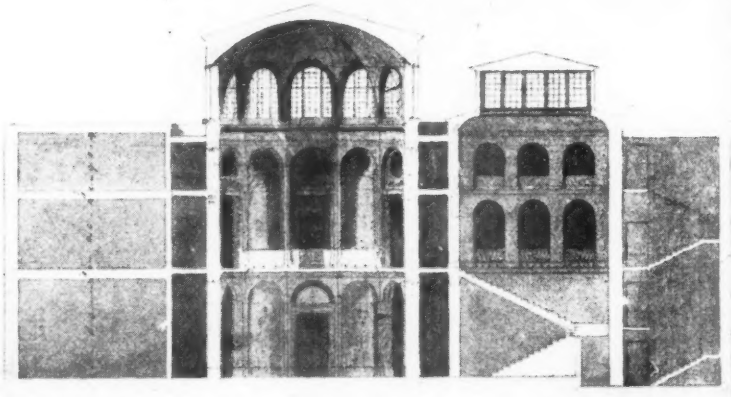


Fig. 11: Section of a Mansion in Devonshire Place, London, for Sir Thomas Baring, Bart.

In his old age Dance gave up architecture entirely and in his discouragement he concentrated on the portraiture of his friends. This more 'painterly' part of his oeuvre was published by Daniell as were also his earlier plans of the double bridges. Dance's portraits are simple tinted drawings in profile which reveal the tectonic quality of the face, reveal in fact the architect in the portraitist, and they are well rendered by Daniell. But it is equally characteristic that Daniell entirely transposed the style of Dance's architectural project, adding numerous craft on the river, substituting in fact a 'genre' picture for an architectural plan.

Outside England the austerity of Dance's style may be compared with the pre-revolutionary architecture of France. Unlike Boullée, Dance was never theatrical; unlike

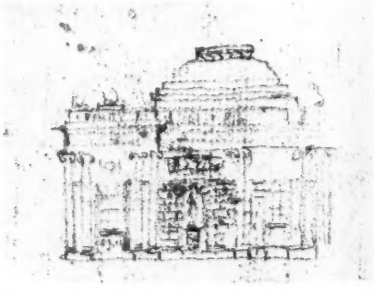


Fig. 12: Sketch of a Mansion, *c.* 1780

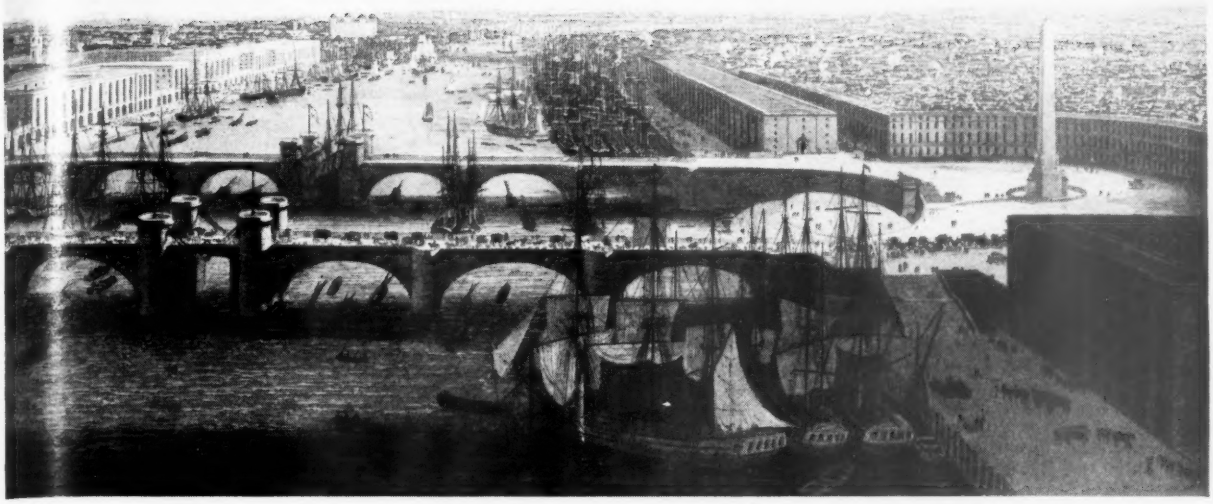


Fig. 13: Port of London, engraved by Daniell, after Dance, 1802. Detail.

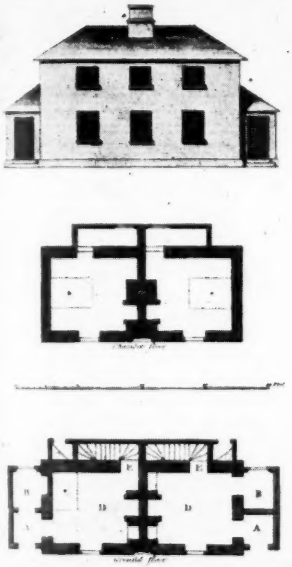


Fig. 14: Cottages after John Wood the Younger

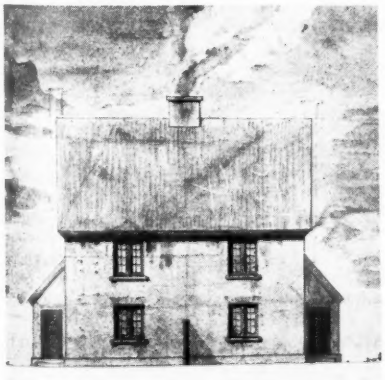


Fig. 15: Elevation of Double Cottages. Note the omission of the central sham windows, 1806

Lequeu, he was not impressed by archæological quaintness or remoteness. Thus for Dance the Gothic style was traditional and not a fanciful discovery, and so deserves preservation together with Classical or Baroque motives. It is his emphasis on function in architecture, and his austerity of design which secure him a significant place in the English and European architectural traditions.

Comparing Ledoux with Dance, certain similarities as well as differences may be observed in which the national characteristics are revealed, together with the personalities of the two architects. In fact they both stand for their respective civilizations. Ledoux as a Frenchman designs ideal towns and high houses suitable for division into flats (Cf. his designs for the Hosten estate). He is interested in a *norm* for building. It is the ideal urban layout he wishes to achieve, and he pursues general ideas rather than any concrete architectural commission. On the other hand, Dance draws cottages for agricultural workers for Stratton Park in 1806, and it is from each individual situation that he develops his schemes, as in his designs for the Port of London. In doing so he may attain solutions of a quality which deserve to become norms. With both these architects it is not the completed work which is the most significant, but it is their endeavour to transcend their own time and the utilitarian limitations of their commissions by striving for perfection.* Both were pioneers. There is kinship with regard to their aims, but their starting points appear diametrically opposed. Their similarity is not only based on the common language of their period, the late 18th century, on their ever renewed insistence on giving the clearest answers to the architectural problems confronting them, but in a powerful response to social conditions which were slowly shaping the new industrial age and our own epoch. They thus became pioneers in the creation of a new physical environment.

*If one wishes to express the difference between these two architects in the terms of the psychology of C. G. Jung, Ledoux appears as an 'extraverted thinking type', Dance as an 'introverted feeling type'.

Note.—I wish to thank Mr. John Summerson, the Director of the Soane Museum, and Miss Dorothy Stroud; Mr. James Laver, Keeper of the Print Room of the Victoria and Albert Museum, and his staff; Mr. Raymond Smith, Librarian and Curator of the Guildhall; Mr. R. E. Enthoven, Librarian, and Mr. R. H. Williams, Assistant Librarian, R.I.B.A.; the Staff of the Print Room of the British Museum, and the Authorities of the Bibliothèque Nationale, Paris.

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Practice Notes

Edited by Charles Woodward [*A*]

MINISTRY OF HEALTH CIRCULARS. Circular 117/47 dated 2 July deals with the issue of licences for special types of work and indicates that licences may be issued for painting and decorative work outside the allocated quotas of labour provided that only painters are employed and there is no shortage of painters for priority work. This notification cancels paragraphs 7 and 8 of Circular 19/47. Such painting work should be carried out in accordance with the recommendations contained in the Interim Economy Memorandum on the use of paint issued by the Ministry of Works. Supplies of building paint are now more freely available.

Licences for particular categories of work may be issued outside the allocated quotas. Such cases are those which only require specialist workers and a negligible amount of building materials. These cases include french polishing, supply and laying of rubber or cork flooring, repair of lifts, insertion of plate glass windows and other shop-fitting structural work with negligible quantities of softwood and the employment of only shop-fitting craftsmen, repair of agricultural buildings carried out by specialists in this class of work, including thatching and well sinking, conversion of heating or hot water systems from solid fuel or gas firing to oil firing with the support of the Ministry of Fuel and Power or the Petroleum Board, installation of free standing heat storage cookers, boiler or combination stoves where minor structural alterations are involved and a negligible use of local labour, chestnut pale fencing and reinforced concrete posts with strands of wire but not fencing with artificial stone concrete blocks or any other form of steel or timber fencing. The cleaning of paint or stone by specialist processes may be carried out without a licence provided the work is complete in itself and does not form part of a painting operation.

Application may be made for licences covering work not specified above in which it is claimed that non-local specialist labour will be employed and the use of materials suitable for house building is not involved. In cases of building new houses or for major works of repair or conversion enquiry of the Licensing Officer of the local authority may be made by letter whether local conditions are likely to permit the issue of a licence. This avoids the expense of preparing plans and specification for building work which cannot possibly be authorized at the time of application and for which no definite starting date can be foreseen. The letter of enquiry may state special circumstances justifying priority of treatment. The information given in reply to such a letter will be merely a general statement of local conditions and not a formal decision.

COST OF BUILDING EXCEEDING THE SUM LICENSED. In a recent law case a firm of builders sued for the balance of an account for making good war damage. The defence was that the work had been done but the licence was for only £250 and the work had cost £379 and that there had been an illegal performance of any work in excess of the licensed sum and so the whole of the contract was unenforceable. No supplementary licence was issued but the Regional Licensing Officer said that no further action was proposed and that a claim to the War Damage Commission would not be prejudiced.

The Judge, in giving judgement, said that because of the Regulations it was clear that in so far as he had done work in excess of the licensed figure the builder had done so illegally and could not recover. He therefore gave judgement for £250, the amount of the licensed figure with interest at 3 per cent and costs.

CONTROL OF BUILDING OPERATIONS. The control of building operations (No. 9) Order, 1947, dated 8 July 1947, extends for a further period of six months (from 1 August 1947 to 31 January 1948) the free allowances which may be carried out in building or civil engineering work without a civil building licence. Work may be done on any single property if its cost together with the cost of any other work done without such a licence on that property during the period, does not exceed £10. In addition, during any one month, work costing not more than £2 may be carried out without a licence. This £2 monthly allowance is not cumulative. 'Property' means any property the full value of which was ascertained for the purposes of an assessment under Schedule 'A' in force at the time, or was at that time the subject of a valuation shown in the Valuation List for the time being in force, or if neither of these conditions apply the building or site on which the work is carried out, together with any land or building occupied with that building or site. Where any building, which for the purposes of the Order constitutes a property, comprises two or more parts which are occupied or constructed for occupation as separate dwellings, each of those parts shall be deemed to be a separate property and the remainder of the building shall also be deemed to be a separate property. The Control of Building Operations (No. 8) Order, 1946 (*a*) is revoked, and the present Order came into operation on 1 August 1947. (S. R. and O. 1947, No. 1439.)

WAR DAMAGE REPAIRS. Owner dissatisfied with the work carried out. A case in the Brentford County Court is of some interest and is reported in THE ESTATES GAZETTE for 26 July. The facts were that the owner of a war-damaged house accepted an estimate from a builder for £189 and the work was carried out. The owner paid only £101, and the builder sued for the balance of £88. The defence was that the work had not been carried out in a workmanlike manner. The owner claimed and had received from the War Damage Commission the amount of his claim and the point arose as to whether in those circumstances the owner was stopped from saying that the work was badly done or from paying the builder the full amount, having regard to his having received the money. Form C.2, signed by the owner, stated that the damage had all been made good and that all the materials had been supplied. An inspector from the War Damage Commission had inspected the premises and had found that the work had been done.

In giving judgement the County Court Judge said there was no document signed by the owner which recited that the work was properly done, and the inspector from the Commission had merely stated that the war damage had been made good. The War Damage Commission pay on the assumption that the work has been properly done and inspected, but that does not preclude the *owner* from alleging that the work has not been properly done, and the fact that payment has been made by the Commission to the owner does not stop him from claiming from the builder for alleged defective work. The Judge held, therefore, that the owner could proceed on his counter-claim against the builder for alleged defective work.

COMPENSATION (DEFENCE) ACT, 1939. In a claim under the above Act before the General Claims Tribunal the point at issue was whether, under Section 2 (1) (*a*), in assessing the compensation rental payable in respect of requisitioned property, regard was to be had to a restrictive covenant in the lease limiting the use to which the property could be put. It was agreed that if the restrictive covenant was to be taken into account the fair compensation rental was £500 p.a., but if not the rental was £1,400 p.a. The Tribunal found in favour of the claimants and awarded compensation at the rate of £1,400 p.a. A full report of the case appeared in THE ESTATES GAZETTE for 24 May 1947.

WAR DAMAGE COMMISSION. Cost-of-Works Payment for War Damage. In Practice Notes in the JOURNAL for May 1947 the judgement of the Court of Appeal in the case of Brigadier D. A. S. Browne *v.* War Damage Commission was given. The Court dismissed the appeal of the Commission from the judgement of Mr. Justice Vaisey, which was reported in Practice Notes in the JOURNAL for 13 January 1947. It is understood that the case will not now be taken to the House of Lords and, therefore, the Court of Appeal's decision stands. It will be noted that that Court reserved the question whether, in some other case, the facts might, or might not, justify an apportionment of the cost of reinstatement.

MINISTRY OF TOWN AND COUNTRY PLANNING. The Minister has made Regulations in respect of compulsory purchase under the New Towns Act, 1946 (S. R. and O. 1947, No. 1353, price 1*d*.).

Experimental Building Station at Witton, Birmingham

For the Metals Division of Imperial Chemical Industries, Limited

Architects: Arcon

Fig. 1: The aluminium ladder

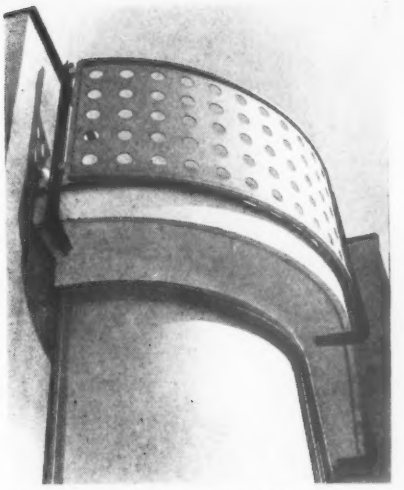


Fig. 2: The aluminium pierced balustrade

EARLY IN 1943 the Metals Division of Imperial Chemical Industries set up a Main Development Committee to study and report on non-ferrous metals as applied in various fields of activity, the detail work being divided between a Transportation Panel and a Building Panel. On setting to work, the Building Panel at once realized that there was a lack of reliable data regarding the behaviour of various non-ferrous metals in buildings, and although I.C.I. have many building technicians on their development staff it was felt that the co-operation of an independent firm of practising architects would more closely link the actualities of building with theoretical investigation, and therefore Arcon were called in and became members of the Building Panel. Thus was begun what is probably a unique example of co-operation between a great industry and a firm of architects, each contributing knowledge and experience from their respective angles.

It was decided to erect an experimental building which would form a permanent framework in which various non-ferrous materials could be inserted and their behaviour in combination with other building materials noted; in September 1944 the necessary licence was obtained and work was started, but owing to war conditions the building took two years to erect. It is built on an open site belonging to I.C.I. situated on the bank of the river Tame; being a detached building it is thus exposed to weather coming from all points of the compass and it is near enough to the mills and shops of I.C.I. to be affected by any discharge that may reach it from the chimneys. It would not be easy to place the building where it would be exposed to more severe tests.

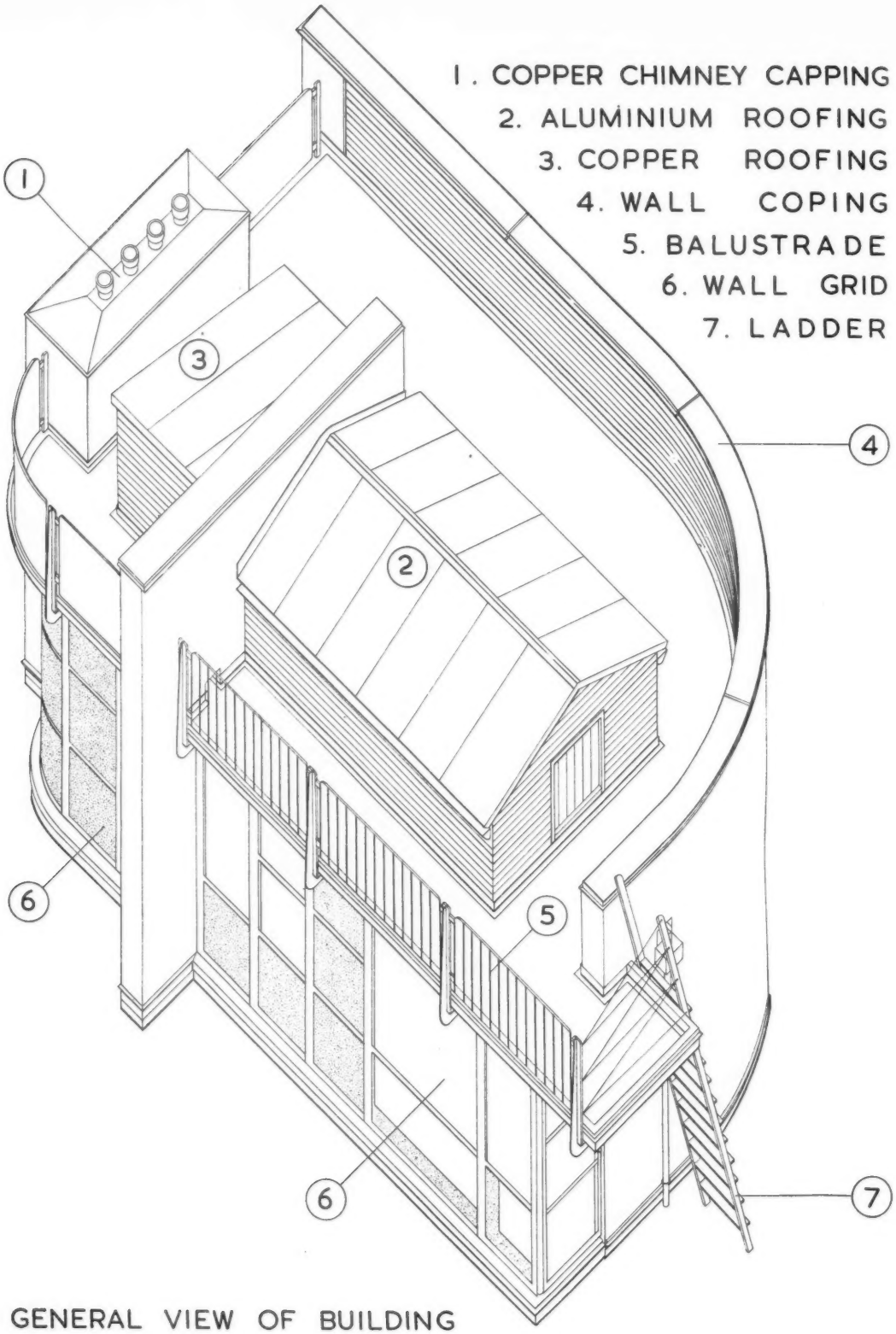
Although the building was in a sense completed by January 1947 it is not intended that it shall ever be considered *finished* because as new materials and techniques are suggested from time to time they will be tried, when the behaviour of the existing components has been noted and tabulated. The original intention was to test components from various sections of I.C.I., but as the work progressed the project was expanded to include affiliated industries, thus increasing its value in the attempt to solve some of the technical difficulties that beset building in these days. At the same time new designs have been got out for certain components so that their suitability may be tested.

Up to the damp-proof course the foundations are of normal character, as it was not desired to pull down any part of the building below that level in order to observe the behaviour of an innovation. The floor is in two layers of concrete separated by a waterproof membrane of copper strip .008 in. thick, lapped and sealed with trinasco grade S mastic supplied by the Limmer and Trinidad Lake Asphalt Company Ltd., and there is a specially designed copper component which links the membrane in the floor with the d.p.c. in the walls and also acts as a flexible member to allow for any movement between the wall and the floor. Damp-proof courses, flashings and copings are used in kynal P 10 commercial aluminium and other kynal aluminium alloys. These items are applied to normal 11 in. cavity-wall brickwork, and their behaviour is observed as against that of copper used under similar conditions. Copper wall ties are used, made from 1 in. by $\frac{1}{8}$ in. copper tape, twisted and fishtailed.

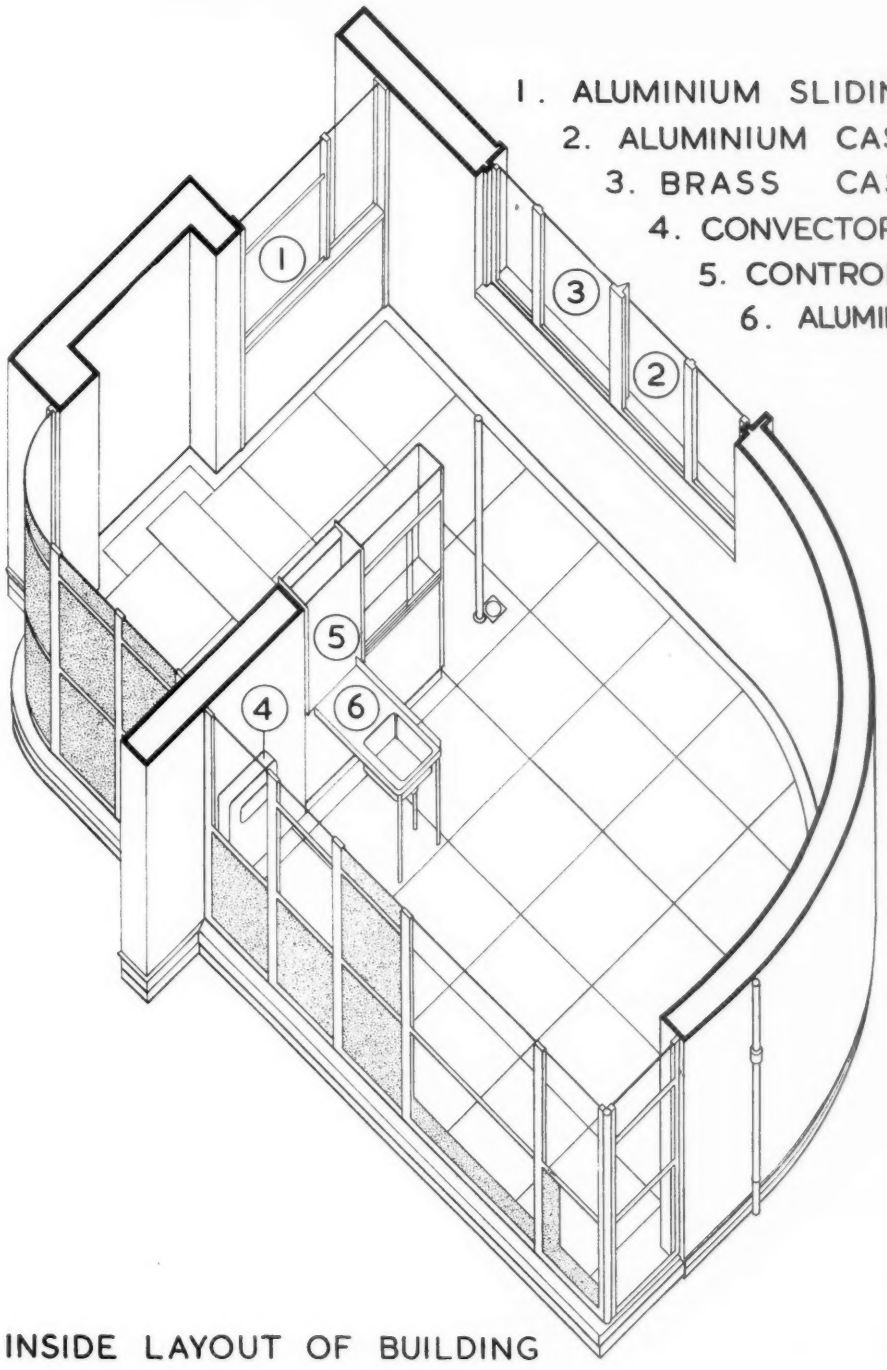
The brickwork has been faced externally with rendering, carried out in accordance with a specification issued by the Lime Division of I.C.I.; it consists of a backing coat of Portland cement and sand, 1:2½, thrown on with a trowel to form a very thin coat; an undercoat followed made up of limbux hydrated lime, cement and sand in the proportions 1:1:6, and this was finished with a coat of similar mix to the undercoat thrown on and levelled with a board and finally finished lightly with a trowel. A textured finish was given by scraping the surface of the finishing coat, when just sufficiently dry, with a board on which expanded metal had been stretched, the final effect being produced by using a steel rule. Arcon devised a special metal component to act as a vertical stop to the rendering and this is shown in Fig. 3. As a horizontal stop to the rendering another special design was used; Fig. 4 shows the profile and the manner in which the rendering sits on it.

The roof is of normal reinforced concrete construction, finished with asphalt and was designed to support experimental types of pent-houses, and here the opportunity was taken of experimenting with flashings and copings of both orthodox and new designs. Fig. 5 shows a coping component, used in the part of the building where the balustrade occurs. The metals employed for these are copper, P.10 commercial aluminium, and P.A.19 aluminium alloy. The balustrade consists of tee-section supports, shown in Fig. 5, attached to the underside of the roof overhang, but various methods of in-filling between the supports have been used, as will be seen from the illustration showing a general view of the building. The open type balustrading is in aluminium alloy kynal M39/2, extruded and fully heat-treated, and anodized to a natural colour by the sulphuric acid process. The other type is illustrated in Fig. 2, which shows that it is of sheet construction perforated with round holes and framed in a surrounding rim. In this case the material is the aluminium alloy kynal M35/1, finished in the same manner as the open type balustrade.

Access to the roof is by means of an almost vertical ladder of ingenious design. Walking up such ladders is an awkward business as it is not very comfortable (or clean) to grasp a flat plate steel string. At the experimental house the ladder is formed with a string of bulbous section so that it forms a comfortable grip for the hands, and Fig. 1 gives an indication of the shape. This string-handrail is extruded from kynal M39/2 aluminium alloy, but is not anodized. Two varieties of alloys have been used



GENERAL VIEW OF BUILDING



INSIDE LAYOUT OF BUILDING

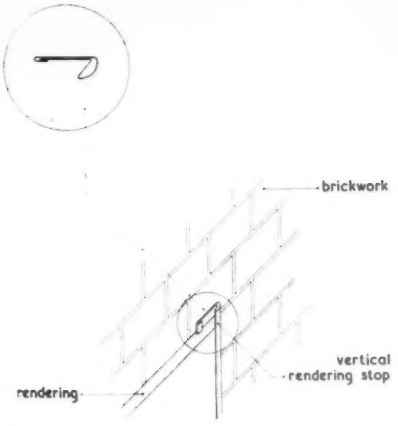


Fig. 3: Vertical rendering stop

for the treads, half the number being in kynal M35/1 and the remainder in M35/2.

The roof was purposely made flat so that various types of pent-houses can be tried out from time to time. At present there is one with a double pitched roof and another of the lean-to kind. The first is the subject of a provisional patent taken out by I.C.I. Metals Division, and is intended to take new forms of prefabricated metal-covered roofing panels. The rafters are of a special roll-formed channel section and the panels are pressed down against the rolls; bolts passing through the channel are then tightened and so give an added grip to the panels. There is a perceptible clearance between the edges of adjoining panels, but this does not matter, because any rainwater that passes between them falls into the hollow channel rafters and so runs down them and away. In fact, the rafters act as sloping gutters. The lean-to roof is formed with manganese bronze glazing bars extruded from a die made to the designs of Steel Fabricators Ltd. of Birmingham and are the subject of a patent held by the British Patent Glazing Company Ltd. The panels between the bars are of plywood $\frac{1}{4}$ in. thick, covered with 36 s.w.g. copper.

Several different kinds of windows and wall fillings are under observation. The window marked 1 in the illustration of the inside lay-out is interesting because although it is of the counter-balanced double-hung sash type it has been so designed that it will give 100 per cent opening instead of the usual 50 per cent afforded by the normal type, and this is effected in the following manner: each sash can be raised or lowered independently of the other, but when the top rail of the upper sash reaches the meeting rail of the lower sash they interlock and both can then be lowered into a space formed for the purpose in the window back. Flexible linings prevent rain causing trouble. This window was designed by the Aluminium Window Company, of Birmingham; the metal parts have been scratched-brushed only so that observations can be made of the effects of atmospheric action on this finish. The window marked 2 is of an extruded section in fully heat-treated aluminium alloy and soft temper strip of the same metal, the whole being anodized to a self-colour by the sulphuric acid process. The window marked 3 is also of extruded sections but in this case of brass, with subframes and sills of manganese bronze of 14 s.w.g. It was designed and made by Messrs. Henry Hope and Sons Ltd.

In the illustration showing a general view of the building it will be seen that the wall filling at the lower part of the drawing is marked 6 and is referred to as a wall grid. This is because it consists of specially designed units which extend from floor to ceiling. Messrs. Williams and Williams Ltd. made one range in aluminium alloy kynal M39/2, anodized a natural colour, and the other in kynal M35/1 polished only, leaving atmospheric action to effect a natural weathering. This framework, or grid, has been filled in with various materials; where the squares in the illustration have been left blank the in-filling is glass; in those that are tinted various experimental materials have been inserted, including resin-bonded sawdust panels, resin-bonded plywood, vynide leather cloth on plywood, and sheet aluminium etched by an alkaline solution and anodized by the sulphuric acid process.

INTERNALLY. The concrete floor at ground level has been surfaced with two materials, terrazzo and magnesite, each divided into squares of approximately 3 ft. by strips of brass, kynal P.10 commercial aluminium, kynal C.65 and M.35/1 aluminium alloys, so that any corrosion of these strips can be noted. The plastering of the walls was carried out according to a specification prepared by I.C.I.

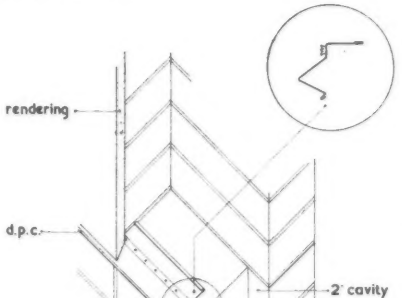


Fig. 4: Horizontal rendering stop

Two techniques were adopted in plastering the ceiling, one portion of the area being given a first coat of cement, lime putty and sand 1:2:9, well mixed with hair, the finishing coat being limbux lime putty and sand 1:1, gauged with $\frac{1}{4}$ part of retarded hemi-hydrate plaster. The remainder of the ceiling was treated in a similar manner except

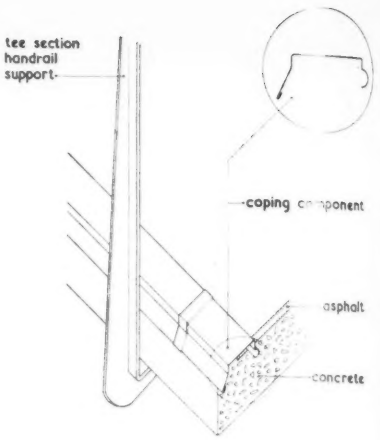


Fig. 5: Coping component

that the first coat was made up of limbux putty and sand, 1:3, gauged with $\frac{1}{4}$ part of retarded hemi-hydrate plaster. The Paints Division of I.C.I. prepared the specification for the decorations, to suit the various types of internal plastering.

In running the electrical service two kinds of wiring have been used; one is the broduit copper conduit, and the other the pyrotenax mineral insulated copper-covered cable, each being jointed with appropriate components. The Plastics Division of I.C.I. made a corrugated baffle in perspex to be hung under the fluorescent lights. The gas installation is in light-gauge copper and in aluminium tubing, the lengths of copper tubing being connected with capillary solder fittings and compression joints. The material forming the aluminium tubing is kynal P.10 commercial aluminium, the compression elbow joints, machined nuts and compression rings being in kynal alloy M39/2. Only one material has been used in the cold water service, and this is standard light-gauge copper tubing with compression fittings and capillary solder joints.

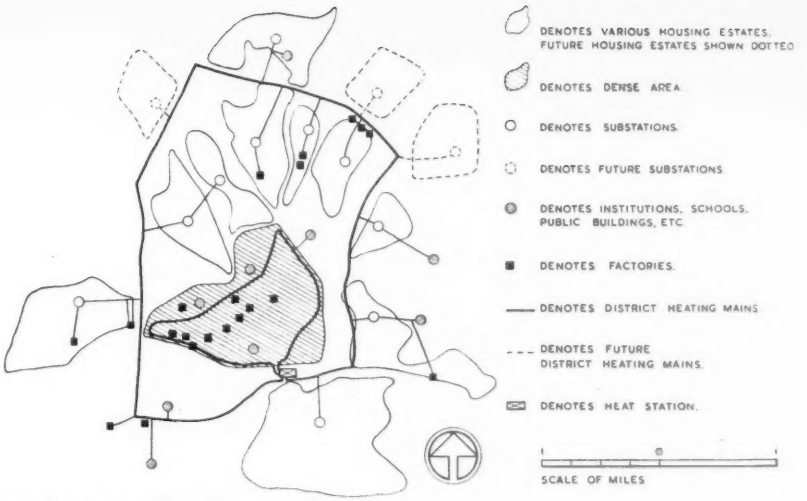
General heating is by means of an accelerated hot-water system using a calprifier, pump unit and tanks which are housed in a separate building whence the mains run underground into the experimental building and are connected to heating units of the convector type. The tubing is run in standard light-gauge copper, with compression fittings and capillary solder joints.

This experimental building marks an important and interesting step forward in the development of research as applied to building, and is one that could hardly be undertaken by any other than a big organization. That the I.C.I. have erected it in collaboration with a firm of practising architects ensures that actual working conditions have been employed in a miniature building wherein the behaviour of materials may be studied in the calm atmosphere of a field laboratory, and where failures or defects are welcomed if they lead to a lessening of the distance between present conditions and perfection.

District Heating

by J. R. Kell, A.M.I.Mech.E., M.I.H.V.E., M.Inst.F.

Read at a meeting of the R.I.B.A. Architectural Science Board on 4 June 1947. Mr. S. Pointon Taylor [*F*] in the Chair


DENOTES VARIOUS HOUSING ESTATES. FUTURE HOUSING ESTATES SHOWN DOTTED
DENOTES DENSE AREA.
DENOTES SUBSTATIONS.
DENOTES FUTURE SUBSTATIONS.
DENOTES INSTITUTIONS, SCHOOLS, PUBLIC BUILDINGS, ETC.
DENOTES FACTORIES.
DENOTES DISTRICT HEATING MAINS.
DENOTES FUTURE DISTRICT HEATING MAINS.
DENOTES HEAT STATION.
SCALE OF MILES

A project for district heating

Brief Historical Reference

IT IS usual to begin a review of district heating by stating that the first system was installed in 1877, at Lockport in New York State, U.S.A. The author would like to go back earlier than this, and refer to a proposal for district heating, advocated some time during the 1830's, in this country. Charles James Richardson, an architect and the pupil of Sir John Soane, referred, in his popular treatise on the warming of buildings, to such a proposal in the following terms: 'The benevolent and talented author of *Suggestions for the Architectural Improvements of the Western part of London*—Sidney Smirke, F.S.A.—proposes a plan for substituting healthy, cheerful and cheap lodgings in lieu of the dismal abodes of the labouring poor in the Metropolis'; and he adds a note that Mr. Brunel has suggested to him 'the practicability of *laying on heat* to a long range of those dwellings, by Mr. Perkins's system, from one common source, a contrivance which, if perfected, would be of inestimable importance in London where the high price of fuel is a burthen to the poor.' It is curious that, after such distinguished patronage, nothing came of the idea, and as usual it was left to a foreign country to develop it. It is also necessary to recall to a body of such eminence in the architectural world, the fact that it was an engineer, Mr. Brunel, who originated the suggestion, though it is true that the mouthpiece in this case appears to have been an architect.

The next early reference which appears in this country is in 1848, where, in the Penny Cyclopædia, mention is made of a scheme to utilize the waste steam from mill engines in Birmingham for the heating of bath water for the poor of Birmingham. Reference is made to the great waste of steam which goes on daily and to the free supply of baths which could be made available, and it envisages bathing establishments 'surpassing those of Imperial Rome'. Once again, apparently, the idea was still-born, and no record exists of this marvellous scheme being brought to completion. One wonders how many hot baths have puffed out of Birmingham's vent pipes since that day, and the thought of the bathing establishments like those of Imperial Rome is surely pathetic—and in Birmingham too.

It is to 1877 in Lockport, U.S.A., then, that one must look for the first actual example of a district heating system supplying heat in the form of steam to various office buildings, houses, etc., by piping laid in the streets, on a commercial basis. The scheme was initiated by a Mr. Holly, who later installed similar systems in various other towns and cities. Numerous difficulties were encountered and some failures, but on the whole the scheme was a success, and, of course, others followed. In the United States in 1909 the District Heating Association was formed, and by 1932 a total of some 161 towns is recorded as being supplied with a district heating service. Since that date, whilst the actual number of installations appears to have increased but little, extensions of mains and increase of plant have gone on, especially since the war, when, due to labour difficulties, building owners have been glad to be rid of the worry of running their own plant.

In the early days many big buildings generated their own current and used the exhaust steam for heating. Thus when the electric lighting companies tried to get their custom they were faced with the fact that heating was largely obtained for nothing. Building owners were not interested unless heat as well as power was supplied. Many of the electric utility companies in this way became sellers of steam also, and they in turn derived their steam, or a good deal of it, from the exhaust of their generating sets. As time went on these old stations were replaced by much larger ones well away from the city centres, but the steam load still remained to be served and this was done by retaining the boiler plants as straight heat stations. There is, however, now a tendency to return to back pressure generation with exhaust steam piped to the district heating mains. In 1942, 29 of the larger generating stations sold discharge steam for district heating, but this represents only about one-third of 1 per cent of the total electrical generation. 90 per cent of the total steam sold for district heating in the United States was in 1942 supplied by 40 installations, and it must be remembered that the chief consumers are the big down-town buildings with heavy loads concentrated in a small area, relatively to what would be necessary to obtain the same load in this country.

Coming now to the domestic field in America, the recent Mission to investigate district heating in the U.S.A. have, it is understood, found much of intense interest, and we look forward to reading their report. Others present may wish to enlarge on this section, but one gathers that over the past 10 years or so there has been a great development in the use of small straight heat stations serving housing estates under the Federal Housing Authority and the Public Housing Authority. Houses so equipped are given un-metered full-scale heating on a generous scale, requiring no topping-up, the costs being merged in the rent, together with an un-metered supply of water, gas and electricity. How the costs work out the author does not know, but the authorities concerned have, one gathers, adopted these centralized systems largely because of reduced maintenance costs and saving of fuel.

In the U.S.S.R., development of district heating has been mainly on a thermal electric basis, and, of course, did not exist in any form prior to the 1920s. By 1929, 14 stations were in operation, and by 1939 this number had increased to 106. It is understood that the latest five-year plan includes a considerable extension of the district heating service. The early Russian examples were technically, in some respects, crude and faults were encountered which normal engineering practice in this country would have known how to avoid, but in spite of this they have gone ahead and overcome their difficulties. The present regime in the U.S.S.R. could not be expected to run these plants as commercial ventures, and we do not know whether or not they would be economically sound in this country. The policy seems to have been to make the best use of any form of poor local fuel which would otherwise be wasted, so conserving oil fuel and in some cases avoiding the very long hauls of good coal, such as from the

Don basin to distant cities like Leningrad and Moscow where the largest district heating schemes are to be found. Again the buildings served do not appear to be the whole of the buildings of a city, but the principal public and industrial buildings and blocks of communal housing which we might term flats or tenements. It is not clear from such information as we have that the Russians have tackled housing estates of the type we think of in this country, with small houses scattered over the landscape at the rate of no more than 16 or so to the acre.

In Germany, by 1936 there were 28 district heating plants. Many of these were apparently brought into being for the chief purpose of economizing fuel, by making use of waste heat from power generation. The German examples are, like the American, run on commercial lines. They are interesting technically, particularly the example at Hamburg, where large heat accumulators were used to balance the heat and electrical loads. Further examples of district heating exist on the Continent, in Copenhagen, in Sweden, in Czechoslovakia, and in France. Many of these are of a local nature, and little beyond the centralized institutional type of system, which we encounter here.

Coming now to this country, the first example of a district heating installation dates from 1911, when the Manchester Dickenson Street scheme was started. This scheme took steam from a generating station, and supplied heat to warehouses and offices adjoining. It was not extensive in area covered but is interesting in that it proved once again the efficiency of the power/heat combination. In 1929, the power generation was abandoned at this station, and the system now runs as a straight heat system from the old boilers. The other examples in this country occur in Dundee where there are two schemes, one erected in 1920 and one in 1922, each for about 250 houses of the two to three room type. In the first, steam is used to supply heating and hot water to groups of houses through calorifiers, and in the second, hot water is used throughout, heating and hot water supply being kept separate on a four-main system. The average cost per house at the date of installation is mentioned as £114, but some saving in flues was apparently effected, for which an estimated figure is given of £37 per house. These schemes are interesting, as heat and hot water have been supplied at as low a figure as between 3*s*. and 3*s*. 6*d*. per week, and apparently over a number of years the costs have come out about level with revenue. It is understood, however, that the present charges have risen to between 5*s*. 6*d*. and 6*s*. 6*d*. per week, and there has been some suggestion that all the costs have not been included, some having been borne by public bodies and not appearing in the charges made. There has been a good deal published about these schemes for anyone who is interested, and they are the only examples available, excluding the institutional or trading estate type of system, which are not true district heating.

In comparing the possibilities of district heating in this country with experience derived from abroad, it is commonly supposed that the difference of climate here renders the case for district heating less advantageous, as the amount of heat supplied for a given area is less than in colder countries. It is true that the number of degree days in this country, say in the London Region, is of the order of 3,500 to 4,000, whilst on the Continent, Russia and America, the degree days may be 5,000 or 6,000 per annum or even more. This, however, is not so serious as might be thought at first sight, since although the maximum demand for heat for a given area may be less here than elsewhere, the relative annual consumption or load factor is in many cases equal to, if not better than, abroad. In other words, less heat is required longer. This has been found to be particularly the case with housing, especially if the type of heating takes the form of background heating, where a fairly constant load is given for seven months of the year.

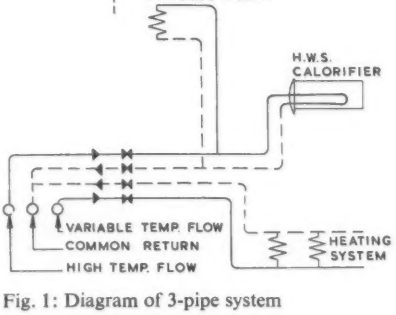


Fig. 1: Diagram of 3-pipe system

The Technique of District Heating Today

The design falls into two parts: (i) The heat producing section. (ii) The heat distribution. The production of heat may be either direct in boilers in a straight heat station, or it may be as a by-product or exhaust steam from electrical generating plant. It is proposed to refer to the latter more fully later, but in either case the design presents no unusual problems. Many extensive heating plants comparable to district heating systems have been constructed in the past for hospitals, factory estates, ordnance factories and the like. In the matter of the distribution of heat, here again normal engineering methods are followed. But with district heating there are some problems which the designer has to face, on which experience of actual working installations in this country would be valuable. There is, for instance, the question of the diversity factor which can be allowed as between the maximum demand and the total connected load for a given number of buildings. There is also the question of economic water or steam velocities in the sizing of mains, and the optimum thickness of insulation. These and other matters would be greatly assisted by direct knowledge of results obtained in practice.

It is necessary to decide on the heating medium to be used—whether steam or hot water, and if the latter, whether at ordinary radiator temperature (about 180 degrees F. flow) or at high pressure (say, at 300 or 320 degrees F.). Also if water is used the question arises as to whether the distribution is by 2-pipe, 3-pipe or 4-pipe system. In the case of the 2-pipe system, everything is served from the one pair of mains. In the 3-pipe system, shown diagrammatically in Fig. 1, the heating is served from one flow main, the hot water supply through indirect calorifiers by the other flow main with a common return. In the 4-pipe method, heating is served from one pair of mains, and hot water supply is served direct without calorifiers from the other pair of mains. There would not be time in the present paper to go into the merits and application of each kind of medium and of each kind of piping system. It must suffice to say that the trend in this country with such new schemes as are in progress or in contemplation is mainly on the basis of hot water as the heat carrier, with generally a 3-pipe or 4-pipe system for small housing estates, and a 2-pipe system for more extensive schemes.

The method of laying the mains in the streets and up to the houses and buildings is next to be decided. One would imagine that every conceivable type of duct and conduit had by now been designed and used, as is indeed probably the case in America. Many of their standard pre-formed conduits are not, however, as yet available in this country, and a designer of a district heating scheme here has to make his own approach to the problem. In so doing there is no reason why he should not produce a more economical solution particularly suiting our conditions, such as in Fig. 2, which shows a conduit developed for a housing estate using the 3-pipe system.

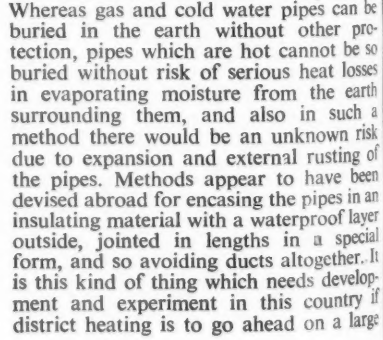


Fig. 2: Section through typical mains conduit

The mains of a district heating system are, of course, hot, and therefore expand and contract with variation of temperature. Whereas gas and cold water pipes can be buried in the earth without other protection, pipes which are hot cannot be so buried without risk of serious heat losses in evaporating moisture from the earth surrounding them, and also in such a method there would be an unknown risk due to expansion and external rusting of the pipes. Methods appear to have been devised abroad for encasing the pipes in an insulating material with a waterproof layer outside, jointed in lengths in a special form, and so avoiding ducts altogether. It is this kind of thing which needs development and experiment in this country if district heating is to go ahead on a large

scale, since it is found that the cost of concrete ducts is one of the most expensive items in the whole make-up of capital charges for these schemes, and everything should be done to keep these costs as low as possible.

In regard to the running of pipes to and from the houses, say, on a housing estate, again the cost of protecting the pipes is found to be a heavy item of expenditure. Thus there is some scope for a designer to reduce the length of the pipes by, perhaps, running his mains along the backs of the houses instead of along the footpaths at the front and then up the garden path. With mains at the back, the run-out connections can generally be quite short. Where the pipes are small, one feels that it should be possible to develop some form of pipe-cum-insulation-cum-waterproof protection, in a flexible form somewhat similar to an electric cable, which could then be run out off a drum and buried solid in the earth. This would greatly simplify the house connection problem. Possibly the use of long continuous lengths of copper piping might be a solution. Whilst the general runs of mains will normally have to be under the streets or pavements, it is, of course, sometimes possible to arrange for trunk mains to run overhead, or above ground, along railway tracks, sides of canals, etc.

Under the heading 'Technique', we might refer to the metering of heat. Whilst this is simple with steam as the medium, by the use of a condensation meter, it is more difficult with hot water and at present much more costly, as a cheap hot water heat meter has yet to be produced. As a result, most schemes for residential estates are framed on the lines of giving continuous heat with some general form of control according to weather, or some limiting restrictive device controlling the amount of heat which can be taken by any individual user. At the same time, public buildings and other large consumers would require to have heat meters.

Before proceeding further, it is necessary to enlarge a little on the combination of district heating with electricity generation, commonly called the *Thermal Electric* system. It will be appreciated that any heat engine, of which the steam turbine is but one example, takes in heat at one temperature, converts a portion of the heat into work, and rejects the balance at some lower temperature. The further apart the upper and lower temperatures, the greater the ratio of heat which can be converted into work. Hence the attempt to raise the initial temperatures and pressures to as high as prevailing design permits and at the same time, at the bottom end, to increase the vacuum so that lower and lower condensing water temperatures may be used. At present steam temperatures have been used up to about 950 degrees F., and vacuums corresponding to temperatures as low as about 80 degrees F. Even so, the proportion of heat extracted from steam converted into work, after allowing for boiler and other losses, achieves a figure no higher than about 28 to 30 per cent, even in the largest and most efficient super power stations. Taking all the stations in the country, the figure is nearer 20 per cent.

If now the low-grade heat at the bottom end of the temperature scale, as in the steam exhausted from the turbines, is used for district heating the overall efficiency can be raised to about 75 per cent. In the normal straight electrical generating station the temperature at which such heat is rejected is of the order of 80 degrees to 90 degrees F. This is, however, of no use for distribution for the heating of buildings, and it is necessary therefore to limit the amount of expansion permitted in the turbine and to reject the heat at some higher temperature such as, say, 200 degrees or 250 degrees F. When this is done the amount of work extracted by the machine is obviously reduced, and to maintain the same output bigger machines are necessary and at the same time bigger boilers. The overall working efficiency is almost independent of the ratio of power to heat extracted, if both are usefully employed.

Thus in a combined station the first important consideration to be settled is at what temperature shall the heat be rejected from the turbine plant and accepted by the district heating system. The higher the temperature, the less the amount of electric current generated, but the greater the amount of waste heat available for sale. Also the higher the temperature, the smaller the sizes of the mains. Complicated considerations to arrive at the optimum temperature are involved here, but it might be mentioned that in Russia the standard appears to be a rejection temperature such that the water flowing to the district heating system can be kept at 240 degrees F. with a return of 160 degrees F. In addition, in the Russian examples, for cold weather operation peak heating is included, as shown in diagram Fig. 3,

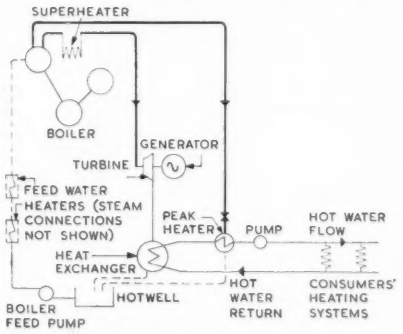


Fig. 3: Diagram of thermo-electric station

served direct from the boiler plant through heat exchangers, to give a maximum flow temperature of 275 degrees F. When it is remembered that the extremely cold weather is only a portion of the whole heating season, this is an economical arrangement since it limits the sacrifice of power, to some extent, by keeping the exhaust steam temperature lower than would otherwise be the case. The raising of the efficiency to about 75 per cent with a combined station, mentioned above, may occur theoretically, but in practice the heat and power loads will not necessarily coincide, as will be apparent from the typical load curves given in Fig. 4 ; and furthermore, during the summer months there will be long periods when there is insufficient heat load to absorb the waste heat from the plant. Thus in order to keep a station at work, giving a reasonable electrical output, the plant would at certain times have to run under condensing operation, but in so doing the overall efficiency would be dropped. In a particular example which has been taken out in considerable detail, the overall working efficiency for a year was found to come out at 69 per cent. The vast improvement on the 20 to 30 per cent efficiency of the normal electricity station will be obvious. It means a corresponding saving of coal.

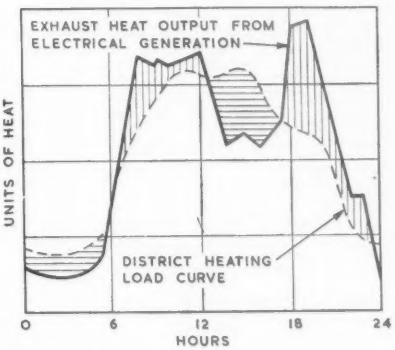


Fig. 4: Winter load curves

The presence of the electric grid in this country should be an advantage to thermal electric generation, since it means that each station can find a sink for the surplus electric current which it may be generating, due to a heavy heating load at a time when the local electricity demand is low. This facility has not been available to the same extent abroad. For this reason the provision of heat accumulators to absorb surplus heat at times when there is a large electrical demand may be of less importance here than it has been abroad. One arrangement of a heat accumulator connection is shown in Fig. 5. In view of the desirability of keeping the temperature of the heating medium down, hot water becomes preferable to steam for use with the thermal electric station since the hot water can be circulated by pump independently of the temperature and pressure of the steam supplying the heat. Indeed, distances of as much as 5 miles from the station can be covered. There are other advantages in the use of hot water, but sometimes for industry steam may be required for process work in which case a dual system would be necessary as shown in Fig. 6.

Official Publications

Some years ago the Heating and Ventilating Reconstruction Committee was set up by the Department of Scientific and Industrial

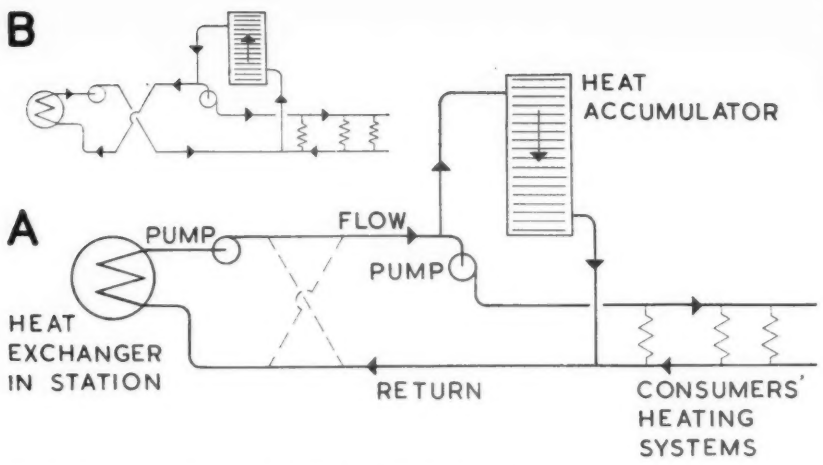


Fig. 5: Thermal storage system. A. Charging. B. Discharging

Research, under the chairmanship of Sir Alfred Egerton. The committee have reported on the heating of dwellings in the Post-War Building Series No. 19. It will be seen from this document that the question of district heating was relegated to a sub-committee. The sub-committee found that more careful investigation was necessary than they themselves could give, and they in turn set up a *working group*, for the purpose of working out particular examples in extenso. The working group, of which the author was a member, with Mr. A. Stubbs as chairman and Mr. H. E. Beckett as secretary, continued their labours for some years and eventually produced their report back to the sub-committee. It was found that there was a great deal more work involved in following one example through to its conclusion than had at first been apparent. In the meantime, the end of hostilities had occurred and the domestic housing problem appeared to be in the forefront. As this particular side of district heating had not been dealt with by the working group, at any rate as applied to the kind of housing estates being envisaged, a separate committee was set up by the Ministry of Fuel and Power and the Ministry of Works jointly, to prepare a 'Memorandum on District Heating as applied to Small Housing Estates.' One or two of the members of the working group who were in the Ministries, served on the memorandum committee, and their report was produced in August 1946.

In the meantime the sub-committee on district heating felt that in view of the increasing interest in the subject it was necessary to issue an interim report, pending the completion of the final report on district heating, and they therefore compiled the 'Interim Memorandum on District Heating', issued in September 1946. The full report of the working group is completed, and copies have been made accessible to public bodies interested. At the Ministry of Fuel conference last autumn, when a whole session was devoted to district heating, Mr. Stubbs gave a review of some of the chief items contained in this report which is referred to more fully later. These three documents cover the official publications on the subject to date. In April of last year the Government established an inter-departmental sub-committee on district heating comprising representatives from the Ministries of Health, Fuel, Works, Town and Country Planning, and of the D.S.I.R. This committee is technical, and its purpose is to report to the Ministry of Health, as the loan-sanctioning body of schemes submitted to that Ministry by local authorities. *The Memorandum on District Heating Applied to Small Housing Estates* is a model of brevity, and of how reports should be presented. Those who have read the memorandum will appreciate the amount of work there is in it, brought down to a small compass easily read and digested. Briefly, the scheme was to examine the cost of district heating applied to four schemes of 122, 241 and 496 dwellings, the latter being taken out with two different types of distribution. The schemes were all priced at 1937 prices, but schemes 2 and 4 were also worked out at 1946 prices. In all cases the heating is by straight heat station burning coal, with no electric generation link-up.

Considering only the 1946 prices, calculated costs come out as in the following summary:

	Scheme 2 (241 houses and flats)	*Scheme* 4 (496 houses and flats)
Capital cost of boiler plant and mains per household ..	£180	£164
Cost per therm delivered to house ..	10.34*d.*	8.18*d.*
Cost of internal installation ..	1.56*d.*	1.24*d.*
	11.90*d.*	9.42*d.*
Weekly cost excluding internal works ..	9*s.* 7*d.*	8*s.* 10½*d*
Weekly cost of internal installation	1*s.* 5*d.*	1*s.* 4½*d.*
	11*s.* 0*d.*	10*s.* 3*d.*

These figures no doubt require some revision for 1947 prices.

Attention is drawn in the memorandum to the fact that as the number of houses increases in a given estate, the weekly charges are reduced owing to certain fixed items, such as labour, being more or less independent of the number of houses served. It is mentioned that for district heating estates smaller than about 300 houses, costs tend to rise sharply. One

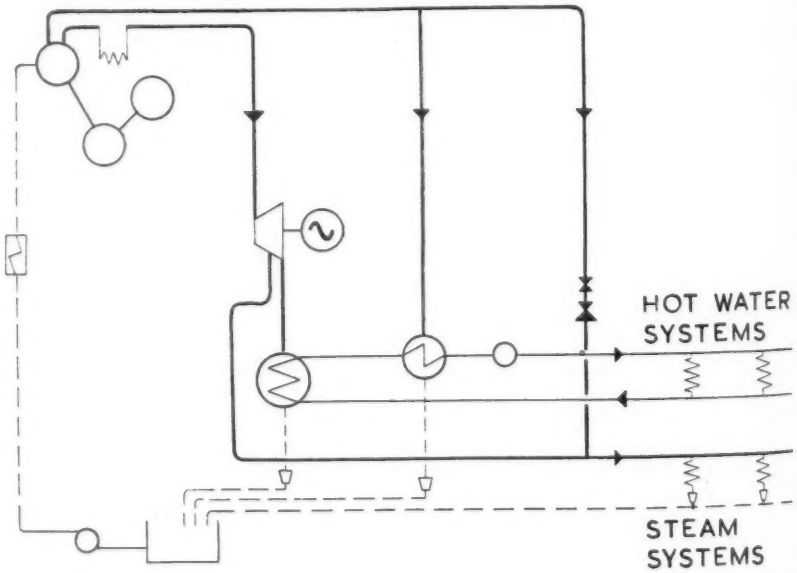


Fig. 6: Dual steam and hot water thermo-electric system

further point to be noted from the Memorandum is that the basis of heat supply per annum has been taken as 575 useful therms per household, of which 182 therms is for the hot water supply, and 393 therms for heating. The latter is assuming a 24-hour usage for 37 weeks, giving sufficient to maintain the living-room continuously at 65 degrees F. during average weather, with some heating in the hall and bedroom; or alternatively, a steady background heat throughout the whole of the house, in which case more topping up would be required in the living-room, say, in the evening, by radiant source such as a solid fuel, gas, or electric fire. The importance to the household of the much greater freedom from damp and condensation with this steady supply of warmth is pointed out. The above quantities of heat per annum have been taken from the district heating Working Group's report, wherein it is mentioned that the present average heat supply per annum per household is of the order of 330 therms, compared with the 575 therms above. In other words, the amount of heat supplied with the district heating scheme is nearly double that of existing methods.

The Interim Memorandum issued by the sub-committee of the Heating and Ventilating Reconstruction Committee is a general statement on the possible scope of district heating in this country, some reference to district heating abroad, and a reference to the factors involved in a combined heat and electric supply system. It contains no proposals or detailed working out of costs, and has therefore little value apart from an indication of the general state of investigation up to September 1946, in this country.

The District Heating Working Group's Report to the sub-committee is at present a confidential document, but, as mentioned above, reference has already been made to it publicly, and it has been distributed in a limited way, pending its ultimate publication as a Stationery Office document. By way of summary it may be said that the report gives the working out of a district heating scheme of considerable dimensions, as might apply to a town of 250,000 inhabitants, covering an area of 25 sq. miles, and including not only housing but industrial areas, public buildings and commercial buildings. The purpose of the scheme was to throw up problems involved in combined heating and electrical generating systems in this country, and the heat production centres round an assumed power station of 133 MW. The output in therms per hour is 20,000, and the annual heat sold to consumers is 42 million therms. The cost per therm at 1937 prices worked out to 4·62*d.* overall, this being the cost as delivered to the consumer. The scheme is based on the use of water at temperatures similar to those mentioned above as adopted in Russian practice. The town was assumed to be divided up into 25 areas, each of 1 square mile, served by a main distribution system with one sub-station in each unit area of a square mile. From each sub-station, sub-distributing mains are taken through the streets to serve the imaginary blocks of buildings in a regular pattern, such as might occur in a new township. Two-thirds of the dwellings are assumed to be served from the district heating mains.

On the electrical side it was assumed that the station would be a grid station, and the C.E.B. were concerned that it should include condensing plant, so as to operate as a normal station should the heat load be insufficient to keep it going as a back-pressure station. The costs were included for this additional plant, and the division of cost as between the electrical output and the heat output has been treated in a manner which may be said not to favour unduly the district heating case. A great deal of information is presented in the report, in such a form that it was intended to be useful to future designers and also useful as a 'yard stick' by which other schemes might be compared. By inserting appropriate factors for a particular case, in lieu of the ones selected in the report, for each different part of the design, the ultimate answer could be determined in advance for any set of conditions. It might be thought that towns of 250,000 population are few and far between, but the committee had the advantage of some discussions with a member of the Ministry of Town and Country Planning, and certain typical development plans were prepared, such as might occur in the case of a large town building satellite housing estates on its outskirts. Maps were prepared of the possible typical development which might arise after a period of 5 years and 10 years, and it was on the latter basis that the basic scheme of the report was prepared.

In view of the rise of prices which has occurred since 1937 the figure of 4·62*d.* cannot now be regarded as having much reality. The costs need to be overhauled to 1947 prices; and indications in general seem to be that the old figure would need to be roughly doubled. It will be seen, then, that a price of about 9*d.* per therm is produced, which is not much different from the order of the figures given in the Memorandum on Small Housing Estates, of 8·18*d.* to 10·34*d.* in 1946. The interesting point here is that due to the electrical link-up involving one large station serving an immense area, a main trunk distribution piping network is necessary, which involves capital charges equal to about 1·18*d.* per therm in 1937, and say 2·36*d.* in 1947. This happens to be roughly the saving which is produced by taking waste heat as the source of heating, so that the saving due to the thermal electric method is eaten up by the additional charges in extra mains, and it means that the small straight heat station can, from a financial aspect, give about the same results as the much bigger and more ambitious generating-cum-heating station. The advantage from a national point of view in the thermal electric method is, however, to be found in the saving of coal. In the working group report it is shown that the annual coal saving for the township in question amounts to about 132,000 tons, or a saving of about ·88 tons per head of population, per annum, and the coal used may be of a lower grade. This is, of course, a highly important consideration, but it becomes clear on closer study that this coal saving could not apply to more than a proportion of installations. First because the electrical output of the station is some four or five times too great for the local requirements, due to the consumption of heat of a given area greatly outweighing the waste heat available from the normal electrical consumption of that area. Second, for various reasons stations cannot in many cases be erected sufficiently close to the main centres of heat load and a thermal link-up becomes either impracticable or uneconomic.

Economics of District Heating, and the Present Trend of Municipal Projects. One of the principal interests at the moment is housing, and the question arises as to what the householder can afford for a district heating service. According to the Ministry of Labour Survey, the average expenditure in 1937-8 on heat, including cooking and lighting, in working-class property, was 6*s.* 5*d.* per week. Of this it is estimated that about 4*s.* was spent on space heating and hot water. Due to the rise of price in coal since then, this 4*s.* might now be equivalent to 7*s.* or 8*s.* Under present rations of coal and coke the maximum which can be spent on solid fuel is about 5*s.* per week. It is clear that unless district heating can be kept lower in price than appears to be the present trend it will not show a financial saving to the householder though, as mentioned earlier, it can supply nearly double the heat for a slight increase on present budgets. It is important therefore to see how costs are made up, and the simplest method of following this up is, perhaps, to take an actual example and the author is indebted to Dr. Faber for permission to refer to figures worked out jointly with him, for a particular municipal body.

The example concerns an estate of 340 residences, including some flats. On the basis of 575 therms per household, and including certain community buildings in the estate and losses from mains, the hourly maximum demand comes out to 100 therms, and the annual consumption to 316,000 therms. Capital costs total £44,000, or £130 per household, and are made up as follows:—boiler plant and building 38 per cent; main piping and insulation 27 per cent; pipe ducts and sundry costs 35 per cent. The annual running cost works out at £10,000 per annum, divided as follows:—fuel oil 57 per cent; electric current for pumps 4 per cent; labour 8 per cent; maintenance, stores, insurances, rates, etc., 7 per cent; capital charges, taking 15 years on boiler plant and 30 years on remainder, 24 per cent.

In this instance oil is the fuel selected for various reasons which need not be elaborated here, but it can be shown that if coal is used instead, the fuel price is reduced but the labour price is increased. The total of oil fuel and labour as above is 65 per cent, compared with 57 per cent in the Memorandum on Small Housing Estates, using coal. Allowing for mains losses, and dividing the above by the actual therms sold per

annum, the price per therm works out at 9·75*d*, and for a typical house the cost per week comes out at 9*s*. It can also be shown that if the scheme is slightly increased to give a higher scale of heating of approximately 700 therms per house, the price goes up to 10*s*. 4*d*. per week. It will be seen that of the above the chief item is fuel. The bare net cost of the fuel is about 5½*d*. per therm, using oil, and with coal at £3 per ton the figure would be about 4½*d*. per therm, allowing for mains losses in both cases.

Taking 575 therms p.a. again as the basis, the annual cost of the bare fuel becomes £13·2 for oil and £10·8 for coal, i.e., nearly as much as is now paid on average, but the 'other costs' have yet to be added.

The larger the scheme, the lower the incidence of the other charges per household, and it is apparent that if total costs must be kept down, either: (i) the scheme must embrace thousands of houses rather than hundreds; (ii) it must be linked up with some substantial industrial or commercial heating load; or (iii) alternatively, if a scheme is big enough to be made thermal electric, the fuel cost figure will be reduced, though with some rise in plant and mains costs.

It may be of interest at this point to compare some of the schemes which have been published to date, as given in the following table:—

Comparison of Various District Heating Schemes for Housing

Type of system	Ref.	Pence per therm	Therms p.a. per house	Cost per wk. per house	No. of houses	Date of Scheme
Thermal Electric ..	A.	4·6	761	5*s*. 1*d*.	8,000	5/45
,, ,, ..	B.					
	1st Sec.	6·0	535	4*s*. 8½*d*.	1,604	9/46
	Final	5·5				
Straight Heat Station	C.	7·3	385	4*s*. 6*d*.	1,317	1/46
,, ,, ,,	D.	6·5 to 6·7	424	4*s*. 6*d*.	560	2/46
,, ,, ,,	E.	8·6	344	4*s*. 11*d*.	522	6/46
,, ,, ,,	F.	8·7	630	8*s*. 0*d*.	182	7/46

It will be noted from the above table that Schemes A and B, which are both thermal electric, show costs per therm slightly lower than the straight heat stations, but all prices may require some revision to bring them in line with 1947 costs. Scheme A has some industrial load in addition to housing. Scheme B is a block of flats giving a highly concentrated load, and it is near to an existing power station from which it is proposed to take back pressure steam from one of the house sets. It is thus a special case, not strictly comparable with the others. Schemes C, D, E, and F are straight heat systems and allowing for present prices may be said to come out at between 7*d*. and 9*d*. per therm. It will be noted that in the case of C, D and E, the supply of heat is on a lower scale than the 575 therms per annum previously referred to, which to some extent accounts for the lower weekly charges. It will be appreciated that no two schemes are alike and strict comparisons are not possible, owing to numerous variables such as planning of streets, configuration of ground, relationship of boiler house to heat load, type and construction of houses or flats, and method of apportionment of costs of pipe ducts in road works. Nevertheless it is hoped that the general trend at the moment has been indicated, particularly in the matter of likely charges.

Apart from the above schemes, dealing chiefly with housing, there have been published one or two others for dealing with reconstruction of blitzed city centres and serving commercial and public buildings. One such scheme was prepared for Coventry, another for Bristol and another for a part of Birmingham. These schemes are interesting technically, but prices which appear in them of the order of 3¼*d*. to 4½*d*. per therm on the basis of pre-war costs require considerable revision to bring them up to date. The above represents most of the data so far published on schemes either under construction or in contemplation, but there are known to be others at present in the report stage, such as the scheme for the City of London, for which a preliminary figure of 8*d*. per therm has been quoted.

Apart from the question of economics there is another side, namely, the advantages of district heating, which are generally referred to under the following heads:—

Convenience—reduction of smoke from domestic chimneys—saving in road traffic due to delivery of coal in small quantities and collection of ashes—elimination of much dirt and labour associated with attending to an open fire or small boiler—saving of coal and use of lower grade coal. To these might be added, so far as houses are concerned, the advantage of an abundant supply of hot water available at all times, and the avoidance of damp, chilly rooms, where no means of heating, other than open fires, is normally arranged.

Where a district heating system serves industrial, commercial and community buildings, it is possible to omit from these buildings a multitudinous array of relatively small boiler plants, with their attendant labour and inevitable low efficiency taken over a period, due to lack of control, unintelligent stoking, etc. On the other hand, it is arguable that some of these advantages are obtainable by other means than district heating, for instance, in the case of housing some of the more modern continuously-burning solid fuel open fires can be used, saving much labour and producing smokeless combustion. Similarly, in large buildings oil or gas firing of boilers may mean continuous high efficiency and absence of the human element.

It appears to the author, however, that for housing the convenience of district heating cannot be over-estimated, especially in these days of shortage of domestic help. It is its convenience which makes electric heating so popular in spite of its extra cost, remembering that at ½*d*. per unit for electricity, heat is costing 9·2*d*. per therm. And so with district heating one may feel confident that once it gets going in this country, and its advantages become apparent at first hand, it will speedily gain ground as the one civilized method of heating. But whereas electric heating means a prodigal extravagance of coal, at the rate of 43 lb. per therm, district heating can do the job with about 14 lb. per therm in a straight station, or about 8 lb. in a thermal electric. Alternatively, if one is comparing gas, it must be remembered that a therm of gas is not the same as a therm of district heat, as the gas has yet to be converted into heat, which may mean a loss of 20 per cent or more, whereas the district heat is 100 per cent available. Furthermore, gas involves some form of combustion appliance on the premises requiring maintenance. Under the heading of future possibilities, one must presumably mention gas turbine stations and atomic energy stations. As to the former, with regenerative heaters, presumably there would not be much scope for collecting waste heat, or at any rate the hot gas discharge would not be easy to harness, say, for heating water for district heating. As to atomic energy, possibly the steam cycle would still be used, and the potentialities of district heating would be improved. There is, however, one gathers, a certain minimum size of such stations, which might involve spreading the heat over greater distances than have so far been considered. Another possibility which might be mentioned is one using gas as the fuel. The scheme assumes complete gasification of coal at the pit head, i.e. with no coke residue, thus avoiding haulage by rail or sea and also obviating coal storage sites at power stations, ash disposal, etc. The gas would be brought under pressure by long mains in a gas grid, from the pits to the towns, such as, for example, London from the Midlands. The gas would be burned in boilers for generating electric current. The use of smaller stations becomes practicable with such a system, since it would be possible to site small gas burning generating stations at any convenient point where heat loads, capable of using the waste heat, occur. Boiler non-availability, one of the bugbears of the coal-burning super power station, would be overcome. At the same time, where a generating station was not warranted, gas could be tapped off and used direct in boilers for small district heating stations. One is aware, of course, that only certain coals are fit for gasification, but the scheme has many attractive possibilities.

Yet another possibility when water power becomes available, bringing a big surplus of current at night time when there is little use for it, is thermal storage on a vast scale, either by heating water direct

electrically or through the heat pump. Such a scheme might develop out of the Severn Barrage.

But the immediate pattern of events which may be visualized for district heating development is first a start, with direct heating stations for housing estates at isolated points, possibly round a larger town forming a nucleus. Second, when sufficient load has been developed in this way, a central station might be set up in the town, either thermal electric, if conditions are favourable thereto, or straight heat, connected by main distribution pipes to the local heat stations which would then become sub-stations. A project of this kind is shown in the illustration at the head of this article.

Whether the station be thermal electric or straight heat depends on how favourable are the conditions to a combined station. It is apparent that heat demand usually greatly exceeds what is available as waste heat from electricity generation. It is also obvious that the present trend of power station development in large units, frequently at points remote from possible heat load, is not favourable to the thermal electric system. For both these reasons it would appear that the straight heat station will have to be adopted in a great many cases but, as pointed out earlier, this does not necessarily involve much difference financially, though in coal saving the combined station is superior. The author questions whether the present system of inauguration of schemes by local authorities may not be confining district heating to a scale too narrow, and he looks for a broader treatment covering larger areas so as to make some worth-while improvement in conditions and amenities, and at the same time effecting a substantial economy in coal. The backing of the architectural profession in this matter is essential, though one hopes for better results than attended Brunel's suggestion!

DISCUSSION

Mr. E. L. Leeming (Surveyor to the Urmston U.D.C.) said that with regard to the Dundee scheme no doubt the rates of interest in 1920 and 1922 were very high, whereas the rate of interest today was about 2½ per cent. That made a very great difference and probably more than compensated for the increased costs. Reference was made in the paper to pipes running in front of or behind the buildings, but he did not suppose Mr. Kell had overlooked the fact that in the case of terrace houses it was quite easy to run the pipes within the houses themselves, either through the floor or the ceiling. The question of costs was of paramount interest to everyone concerned. He knew there was one school of thought which held that about 10*s.* a week was the figure for district heating costs, and he thought that probably Mr. Kell subscribed to that view. It would have been noticed that the figure for Urmston given on one of the slides shown by Mr. Kell was 4*s.* 6*d.* per week per house. In Urmston a scale of charges had been laid down, and the figure was about 5*s.* 3*d.* It was only an estimate.

Mr. Kell had stressed the saving of fuel effected by district heating, but he had not said much about insulation problems in the houses themselves. Personally he thought it was by insulation that fuel economy would be achieved. The Ministry of Health had issued a circular to local authorities and architects and surveyors in charge of schemes, saying that they must do something with regard to insulating ceilings, cavity walls, etc. He did not know to what extent that had been done, but it was very easy in the district heating scheme at Urmston to insulate the ceilings with glass wool. That cost about £7 per house, and he thought it was money well spent in a district heating scheme or in any other type of heating. He thought the fact that one was more or less compelled to put in concrete floors on the ground floor, instead of wooden floors, would cause a saving of heat within the house. In the circular to which he had referred it was hinted that it might be necessary to reduce the size of windows. He did not know what view architects would take about that. Personally he did not think it would matter very much if the windows of bedrooms were a little smaller. In the case of the living-room, where there was the greatest heat loss, because the room was kept at a higher temperature, a double window might be installed, and he thought consideration should be given to the question of designing houses to allow for a double window to be put in in the winter, until such time as a double glass was developed to be put in as a single pane. Many local authorities seemed to be shy about district heating, and it had provided some problems for the authorities in Urmston, but a number of local authority representatives had come to see the system there and had been very impressed by it and enthusiastic about it. Among them had been people from the mining areas, which he thought should have the highest possible priority for district heating, first because the fuel would be cheap and, secondly, because district heating would probably lead to the abolition of the free coal system. A great deal of free coal was given to the miners as a sort of perquisite, and he thought that if every miner who received free coal was given free district heating about 1,000,000 tons of coal per annum would be saved. As a matter of fact, the saving of fuel was the main consideration in district heating. There was no need to worry very much about the cost per week. He thought it might be found that the figure in Urmston, which was based upon 7*d.* per 1,000 ft., might be a little low, but there were one or two other matters to be taken into account. For instance, the same amount of money was being allotted for maintenance in the case of the district heated houses as in the case of the other houses, but he believed that the ordinary maintenance costs, such as plumbing and painting, would be less in the case of the district heated houses, so there should be a small margin there. Moreover, he did not think the people would mind paying a little more for the district heating. He would have preferred the capital cost of the Urmston scheme to be equally distributed over the houses, irrespective of the size, and he thought the figure was 2*s.* per unit. He thought that the Ministry of Health could help very much by being a little more generous with regard to the period of the loan. He could not see why the loan period for plant should be in the neighbourhood of 10 to 15 years. He spoke from a little experience in running a fairly modern swimming bath. The loan charges had been worked off, but the plant had been maintained in a high state of efficiency and was just as good now as when it was installed. A longer period of loan on plant would help with regard to the costs and would help to reduce the figure of 10*s.* to which Mr. Kell had referred.

With regard to the design of the houses in which district heating was to be installed, he thought that the fireplace should be omitted. When the Urmston scheme was started he had been a little timid about the public reaction and the reaction of his own Council towards the omission of fireplaces, so ordinary brick fireplaces had been installed, but before the system had been in operation very long there was a little outcry because people were having coal delivered and were having district heating as well, so the brick fireplaces were now being omitted.

Mr. Kell had referred to the Wythenshaw scheme, but unfortunately it was not yet in existence. The houses were being built in Wythenshaw, and if they were going to be put on to district heating afterwards it would involve a fair amount of trouble, disturbance and expense in making the necessary changes. The cost of putting a small boiler unit in and fitting it into the general lay-out of mains did not amount to anything serious, and the people could be given a service from the moment when they took possession.

The social advantages of district heating should be stressed. He believed that district heating opened up a new way of life for the average family and particularly for the average housewife, who was asking for equality in all sorts of ways. She should be given equality and the opportunity to go out in the evening and come back to a perfectly warm house. With district heating a family could go away for the coldest week-end in the year and come back to a perfectly warm house. With district heating people did not need as many bedclothes on their beds. In Urmston, in the very coldest weather the people living in the old people's bungalows had been quite warm with only one blanket on their beds, and they had not needed hot water bottles. All those were items in the domestic household bill in which a saving was effected by district heating. He thought that the reactions of the people in Urmston towards district heating had all been favourable. No one had complained about the charge. It had been worked out carefully, and he did not think it was too low. The charge depended on how the financial arrangements were made in the loans and on the fuel. The fuel question was very important. In Urmston

the four-pipe system was used, which gave a little more mobility; the space heating could be shut off and only the domestic hot water supplied. The capital cost in the beginning might be a little more, but that was compensated for afterwards.

The Chairman, Mr. S. Pointon Taylor, said the Ministry of Health had agreed to the experiment in district heating being made at Urmston, and the Ministry of Health, the Ministry of Works and the Ministry of Fuel and Power all supported such schemes, so that they could get some records kept over a period, from which they could obtain facts and data.

With regard to the point made by Mr. Leeming about the Ministry of Health helping district heating schemes by extending the loan periods, a Sub-Committee of the District Heating Committee was already considering that matter. He did not know whether Mr. Kell's figure of 10*s.* was based on the Ministry of Health's engineering standards for loan periods. If that was the case, it might account for the somewhat high figure.

Mr. Nelson Haden said that there was one problem facing people who were designing district heating systems in this country which he had not heard discussed very much. The people in this country who enjoyed district heating might require a higher and higher standard of heat and hot water, and that would involve a very difficult problem. It was necessary to consider to what extent provision should be made, at any rate so far as internal heating arrangements were concerned, for the increased standard which might prevail in the future. He thought it might be well to use relatively low temperature hot water distribution, because, provided that the internal heating arrangements were properly designed and properly placed, with what he had just mentioned well in view, it should be possible to supply only a certain quantity of heat at the present time, which was all that could be afforded, and yet have provision to raise the temperature eventually to meet the higher standards which he felt fairly certain would subsequently obtain.

Mr. Hartland Thomas said he had been interested recently in trying to find ways of using waste heat to advantage in industrial buildings, and he would like to ask Mr. Kell whether there was any future for collecting odd packets of waste heat in a city like London, with industries sprinkled amongst the houses, and using them in a district heating system, so that losses which took place now could be retrieved.

Dr. Oscar Faber said that in October of last year he had had the privilege of studying all the district heating schemes in Germany, and the chief point which had struck him was the simplicity of those schemes. In nearly all the systems in Germany the ducts were contained in a concrete shell with a channel-shaped bottom, generally about 1½ in. thick, the top of which was only about 1 ft. 6 in. below earth level.

While Mr. Kell was right in saying that in this country there were very few district heating schemes in the ordinary sense of the term, i.e., the distribution of heat to scattered houses, in other senses there were some very big distribution schemes indeed. For example, during the war there was an ordnance factory which contained 1,400 separate buildings, some of which were extremely large, and it required 3 boiler houses, each with 14 Lancashire boilers, i.e., 42 Lancashire boilers in all. The boiler houses were about 2 miles apart from each other, at the angles of a triangle, and they were connected by steam mains, which supplied each of the very large buildings with steam, both for space heating and for process work. Therefore the distribution of heat to large numbers of buildings had been done in this country on a very big scale indeed, and both the technique and economics of the subject were well known. When generating stations were concentrated into very large units, the supply of the waste heat from them was so big a problem as to be impracticable, and, from the point of view of conserving heat from coal, there was a great deal to be said for encouraging the establishment of small stations, where one could make use of the waste heat and had a much smaller distance to distribute it.

He would not like it to be thought that the evolution of district heating schemes that were not combined with electricity was not a practicable and a worthwhile proposition. He thought he was right in saying that, when the District Heating Committee's Working Group produced their report it would be found that the difference in cost between straight heating and heating combined with electricity, in their particular example, was about 1*d.* per therm, which was not an overriding factor.

With regard to a comparison in cost between district heating and other methods of heating, he thought it was important to compare like with like. He did not think it was fair to take the cost per therm of heating a house with district heating and compare that with the cost of a few tons of coal from which, with the expenditure of an enormous amount of labour, some heat could be produced in an open fireplace. District heating produced clean heat of a labour-free type. It might sometimes mean that a servant, who would otherwise have to be employed, was not necessary. Having regard to the laying of the fires, the carrying of the coal, the dust which resulted from open fires, and so on, he did not think that district heating should be compared with the use of coal in open fires.

He would therefore like to plead that, even if district heating would cost a little more than the burning of raw coal in a house, there was an absolutely unanswerable case for it.

The Chairman, in proposing a vote of thanks to Mr. Kell for his paper, said that he thought, with regard more particularly to the architectural side of the subject, the position in this country was rather different from the position in America. The Americans had adopted the policy of including all the utilities—gas, electric light, water, hot water and heating—in the rent of the federal houses, so they obviously regarded that as the rational and right thing to do. They had coal, gas and cheap oil fuel, and the question which was the cheapest and most economical system for any particular district was carefully considered in Washington. In this country, instead of the utilities being included in the rent, facilities for them were provided and the tenant paid for them separately. The district heating schemes which had been approved already and any which were likely to be approved in the future must be on a self-supporting basis, so it was important that they should be considered very carefully from the point of view of economy. Architects came into the matter to a considerable extent, and it was clear that they would be dependent on consultants in many respects. For instance, their consultants would tell them that the schemes must economize in the matter of ducts, because every yard of duct was not only a cost in itself but also a cost because it had a certain percentage of waste heat which could not be eliminated up to the moment. Just as economy had to be exercised in the case of sewers and water and gas pipes, so the lay-out of ducts in district heating schemes must be regarded from the point of view of economy.

He thought it might be found that the idea that straight heating systems would be economic only for large schemes would prove to be wrong and that straight heating systems could be used for smaller schemes, which would bring district heating into the market much more.

Mr. J. R. Kell, in reply, thanked those who had taken part in the discussion and said he had been particularly glad to hear Mr. Leeming's remarks, as Mr. Leeming was one of the few people with first-hand recent experience of district heating in this country.

Mr. Hartland Thomas had raised the question of collecting waste heat. He saw no reason why a large scheme should not collect such waste heat as was available, provided that it was of suitably high temperature. Waste heat was often of a rather low temperature, and it might be difficult in that case to make use of it.

With regard to burying the pipes in the ground without ducts, there was a system in America in which that was done, and he would like it to be tried out in this country.

With regard to the use of waste heat from small stations, to which Dr. Faber had referred, that was a matter which involved the sizing and positioning of the district heating stations if they were to be thermal-electric, and that was a problem affecting very largely the C.E.B., as it had been up to date, but he supposed that at some date in the not far distant future it might be another body, owing to nationalization.

Review of Construction and Materials

This section gives technical and general information. The following bodies deal with specialized branches of research and will willingly answer inquiries.
The Director, The Building Research Station, Garston, near Watford, Herts. Telephone: Garston 2246.
The Director, The Forest Products Research Laboratory, Princes Risborough, Bucks. Telephone: Princes Risborough 101.
The Director, The British Standards Institution, 28 Victoria Street, Westminster, S.W.1. Telephone: Abbey 3333.
The Technical Manager, The Building Centre, 9 Conduit Street, W.1. Telephone: Mayfair 8641-46.

Welding. Behind the statement: 'Welding is a means of joining metals together' there lies a story of research and development dating from the middle of last century. Much experience was gained during the last war, when welding was almost universally used in the manufacture of munitions, but the method is not yet fully developed, especially in the direction of the economies that can be effected by the wider and more effective use of electric welding processes, economies both in material and production time. In shipbuilding, for instance, welding does away with the need for angles or flanges required for riveted connections, and it is estimated that some 200 tons weight is saved in a vessel of 10,000 tons dead weight. Cookers and refrigerators are now being constructed of welded pressed steel, which helps in the production of the modern clean and simple designs. Architects who like to know something about the terms that fall so easily from the lips are advised to buy *The Story of Electric Welding*, which can be obtained from the Welding Section of the British Electrical and Allied Manufacturers' Association, 36 Kingsway, W.C.2, price 1*s*. This brochure explains shortly, but understandably, the various methods of welding; fusion, electric resistance, spot, roller seam, projection, butt and flash-butt. It is stated that taking the number of electric resistance-welding machines in Great Britain in 1939 as 100 per cent, the figure had risen to 212 per cent in 1944; similarly the increase in the consumption of arc-welding electrodes per ton of steel ingot rose from 100 per cent in 1938 to 335 per cent in 1945.

Lime. Difficulties in obtaining timber have led to such an increased use of cement that now even that material is tending towards shortage: in these circumstances a booklet on *The Uses of Lime in Building* comes opportunely; it is issued by the Southern Lime Association (Hanover House, 73-78 High Holborn) and may be read as a useful refresher course on lime, its properties, and its correct use. The chemical composition and method of obtaining lime are briefly explained, followed by notes on the hydraulic properties of quicklime and hydrated lime. Different uses of lime require varying characteristics in the material to ensure good results, and these are set out in British Standard Specification 890:1940, which is in two main parts, one dealing with quicklimes and the other with hydrated limes. The booklet deals with the principles underlying the choice of mortar, but does so fairly, for after setting out the advantages of a mortar based on lime, and of one with the addition of cement, it sums up by saying 'The conclusions to which such considerations lead is that for most purposes a lime mortar gauged with cement will give the most satisfactory results.' Various mixes are then suggested, from the point of view of climatic conditions. The last part of the booklet deals with external rendering and discusses the generally acknowledged superiority of such work on the Continent, which is put down to three factors: the use of a different type of mix, a different method of application, and a different method of finishing. The booklet can be obtained from the Association, free of charge.

Tyrolean Cullamix. The Cement Marketing Company Ltd. have issued a revised type specification for the application of this material. The specification is in four sections, with two appendices, and applies to the use of Tyrolean finish for the following purposes: (1) to provide a decorative finish to concrete block cavity walls or in-situ concrete walls where the joints or shutter marks may be outlined on the finished surface; (2) to provide a weather-proof and decorative finish to walls of brickwork, keyed concrete blocks, in-situ concrete which has an adequate key such as is given by no-fines concrete, and where joints or shutter marks are completely hidden on the finished surface; (3) to give a decorative finish to in-situ concrete and, in addition, a weather-proof finish to dense clay bricks or blocks, or concrete blocks requiring a key for the render coat, and where shutter or joint marks are completely hidden on the finished surface; and (4) to provide a weather-proof and decorative finish to walls of brickwork or porous concrete blocks situated in exposed positions. Direct application to brickwork is no longer recommended. The material consists of cement mixed with a specially graded white sand, and its freedom from crazing is due to its honeycomb texture and the use of a hand-operated portable machine from which the material is applied to the surface to be treated. The machine consists of a

Portable machine for applying Tyrolean cullamix

container into which the mixed cement, sand and water are poured; this container is fitted with paddles, rotated by a handle, which throw the mixture through an adjustable slot into a front container, fitted with fins on a drum which is rotated by a drive connected to the container paddles; an aperture at the bottom of the second drum allows the fins on the drum to flick the mixture on to the surface to be treated. Machines of approved type may be bought direct from the makers. Tyrolean cullamix can be obtained in nine standard shades, white, orange, green, beige, pink, silver-grey, cream, pale grey, and oyster pink. The specification gives advice as to the most suitable colours to use during those seasons when the weather is inclement, as then a temporary efflorescence may mask the colours for a time. The company are prepared to send a demonstrator to the site to ensure that the machines are being correctly operated so as to give the architect the finish he desires; they will also discuss specifications with the architect at an early stage of the project. The new specification takes the place of the previous edition, T.I.Tec. 1946/3, and copies will be sent, free of charge, to those interested who apply to the company's technical department, 192 Ashley Gardens, S.W.1.

B.S.I. Standards Review. The latest Review is No. 7, dated March 1947. It begins with a foreword by Mr. Roger Duncalfe, chairman of the Finance Committee, and then gives some notes on the British Commonwealth Standards Conference held at London in October 1946. The remainder of the review contains articles about the subjects of various British Standards, and other articles of a more general nature, such as 'Some Roman Standards', 'Gambling in Sampling', 'International Organization for Standardization'. The progress of standardization overseas is described in notes regarding India, Canada, Eire, New Zealand, and Chile. Subscribing members can obtain additional copies for 1*s*. each,

and non-members for 2*s*. post free inland in both cases.

Expanded Rubber. Sponge rubber consists of resilient cells which interconnect with one another. A material named rubazote was exhibited at the recent B.I.F., Earls Court, which resembles sponge rubber in appearance but is structurally different, as it consists of minute cells which do not communicate with each other, and the air contained in these closed cells adds to the cushioning effect of the rubber itself, so much so that it is claimed that the same degree of resilience can be obtained with rubazote of half the thickness that would be necessary in sponge rubber. Also, the closed cell structure gives good thermal insulation, and is a protection against the penetration of moisture and bacteria. These qualities suggest that the material should be useful as a floor covering where warmth, a comfortable 'feel', and a long life are required; further, the separate cell construction gives the effect of a honeycomb of small suction cups which have a gripping action on the surface they cover and, indeed, on the base of articles placed on the material. This quality should make rubazote useful for table tops and mats, and has been so used in ships, non-slip mats being provided in H.M.S. *Vanguard* and S.S. *Queen Elizabeth*. The compression resistance of the material is such that a load of 40-50 lb. per sq. in. is required to compress it to half its unloaded thickness; the normal apparent density is 16-18 lb. per cu. ft., so that a square foot of 1 in. thickness weighs approximately 22 oz. A sample $\frac{1}{2}$ in. thick and weighing 18 lb. per cu. ft. tested for water absorption showed that 1.5 per cent was absorbed after six weeks total immersion. The material should not be left for any length of time in contact with concentrated acids, such as sulphuric and nitric, or with concentrated alkalis of the nature of caustic soda and caustic potash. The standard size of sheet is 3 ft. by 2 ft. nominal, subject to a tolerance of minus 5 per cent, and the thickness ranges from $\frac{1}{8}$ in. up to 1 in. The material is made by the Expanded Rubber Company Ltd., of 675 Mitcham Road, Croydon, who also make an expanded ebonite material to which they give the name onazote. This again is of non-intercommunicating cellular structure, and is a useful material for the core of sandwich products, for which purpose it has been approved by London Transport in connection with the roofing of their buses. The thermal conductivity is 0.19 B.T.U. It can be obtained in various densities ranging from 4 lb. to 30 lb. per cu. ft. according to the purpose for which it is required, and can readily be bent to curved shapes.

Alternative floor coverings. The Ministry of Health have had under consideration the use of alternative materials for ground floors, as systems employing timber joists are prohibited. A schedule has been prepared from technical data supplied by the Ministry of Works and has been circulated to housing authorities as a guide in the design of new houses. As the schedule looks beyond the immediate present, information has been included on a wide range of materials, as prices of some may possibly fall, and supply of others may become easier. Certain types of timber flooring are included, such as softwood board, wood blocks, and hardwood strips, and these may be used if elsewhere in the building equivalent economies can be made so that the permitted amount of timber per house is not exceeded. The schedule is divided into three main groups—timber floors, jointless, and jointed floors, and each group has ten columns, the first contains the description of the suggested alternative, the others contain its classification under the headings of appearance, ease of cleaning, noisiness, non-slip, resistance to indentation, warmth, wear resistance, and approximate cost range per yard super, and the last column is for remarks. Noisiness is defined as 'the nuisance effect produced on the occupants by the movement of others in the room.' Classification is indicated under E for excellent, V.G. for very good, G for good, F.G. for fairly good, M. for moderate, F. for fair, P. for poor, V.P. for very poor. Thus by reading across the page the classification under those heads is at once seen. The materials dealt with are solid timber softwood boards on concrete, solid timber hardwood strip on concrete, wood block softwood on concrete, wood block hardwood on concrete, magnesium oxychloride, asphalt mastic, coloured pitch mastic, cement-bitumen, cement-rubber latex, granolithic concrete, cork carpet, cork tiles, coated bitumen felt (not printed or painted), rubber $\frac{1}{8}$ in. sheet and tiles, composition block, clay tiles, resin tiles ('asphalt' tiles) and resin-bonded cork tiles. In the 'remarks' column are notes about the need, or otherwise, of a damp-proof membrane; whether or not much maintenance is necessary in the way of polishing, the need for skilled operatives in laying, and so on. British Standards and Draft Codes of Practice are referred to where appropriate. The circular points out that from time to time manufacturers may be able to supply wood blocks or other material made from slabs, off-cuts, or certain second-hand timber without presentation of a licence, but the quantity thus available will probably not be large. The Ministry hope to issue supplements as information about further materials becomes available. The arrangement of the schedule seems a very convenient one for a quick comparison of possible materials, and could usefully be extended in other and similar directions.

Timber supplies and the housing programme. Under this title the Timber Development Association Ltd. have printed their views on the subject, in the form of a paper prepared by Major W. Newland Hillas, the chairman, and Mr. Philip O. Reece, construction research director. The document was originally compiled for a series of provincial conferences for local authorities organized by the National Housing and Town Planning Council, and was written in the hope that it would make some contribution to a wider understanding of the present situation. In 1937 the import of timber into Great Britain was about 2½ million standards; in 1946 it was rather less than three-quarters of a million; this reduction is, of course, due to the war. In 1937 Canada, Finland, Sweden, Russia, and the Eastern Baltic States contributed some 90 per cent of our imports of softwoods, but—with the possible exception of Canada—it does not seem likely that those countries will be able to send us substantially increased supplies this year unless we can offer an exchange of coal, iron and steel, and manufactured goods. The paper points out that hardwoods do not normally play a very large part in house construction, but since 1945 the manufacturer of utility furniture has consumed large quantities of both home-grown and imported hardwoods; indeed, the extended use of home-grown timber has raised our annual consumption from 45 to 60 million cubic feet, but this strain on our native woodlands cannot continue indefinitely. Regarding plywood, the shortage is relative rather than absolute, as in 1946 our home production made good a large part of the 30 per cent drop in imports as compared with the 1938 figure, but new uses have increased the demand. The authors of the paper then answer the question: 'What is being done about it?' and summarize their reply under three heads: (1) the intensification of effort to secure a maximum share of world production, (2) the readjustment of the system of war-time priorities and licences, so that supplies shall be diverted to the most useful purposes, and (3) the codification of economy measures to ensure the best possible use of the material available. The progress of negotiations in connection with (1) dispels undue pessimism; under (2) the paper suggests that departmental allocations should ensure that sufficient material is made available for purposes where official policy grants priority, and that trade quotas and departmental allocations, linked together by the licensing system, should see that geographical distribution corresponds with local demands. Under the heading 'Economy' the paper suggests that it is now possible to go a long way towards adjusting our standards to meet circumstances and still maintain a satisfactory level of construction, and in this connection reference is made to the economy memorandum, *The Use of Timber in all Building Work* recently issued by the Ministry of Works, a document prepared in collaboration with the Ministry of Health, the research stations and the principal timber-using departments of the Government. In it an effort is made to introduce a technique for establishing safe working stresses with reference to the visible defects and characteristics of the timber used. Appendix B gives information about the timbers commonly available in this country, with particulars of the dimensions and qualities in which they may be obtained.

A copy of the paper may be had on request to the T.D.A. Ltd., 75 Cannon Street, E.C.4.

Correspondence

PLANNING FOR DAYLIGHT

Sir,—The recently published report by Dr. Holden and Professor Holford on the Reconstruction of the City of London is so full of interesting matter, so many examples of the principles of Town Planning applied with wise discretion and fearless common sense, that it is sometimes difficult to see the wood for the trees. Your summary of its main recommendations in the June issue of the JOURNAL is therefore of no small value to the study of a document which well deserves to become the bedside book of every architect, provincial or metropolitan. Why is it so strangely difficult to secure a copy? There should be at least a dozen in the Loan Library.

That portion of the Report which deals with the vital subject of planning for daylight refers largely to an official report, not yet published, on planning for central areas.* It therefore omits many details which are essential for full understanding and renders it difficult to appreciate which recommendations come from the D.S.I.R. and which from the consultants; one of whom, Dr. Holden, years ago gave us—in the design of the London Transport building over St. James's Park station—an invaluable lesson on profitable planning for daylight. This building, now of some international reputation amongst town planners, proves conclusively that area on plan above the ground floor can be devoted more efficiently to deep indentations with one side open in outer walls, rather than to the totally enclosed insanitary abominations miscalled 'light wells'.

The daylight factor value of the sky obscured by irregular obstructions is likely to be an important factor in the future, both as regards indented new buildings and also the irregular effect of existing buildings likely to persist for many long years, partly underbuilt but mainly grossly overbuilt. For many years—many generations possibly—urban re-buildings must endure the proximity of the result of many centuries of unregulated development during which our forefathers regarded as sacrosanct the principle that, subject to the Prescription Act and local building bye-laws, every property owner should be free to do as he liked with his own.

It may, therefore, be of assistance to architects to recall a form of protractor, Fig. 1, devised early in the war to facilitate the calculation of long skylights, but subsequently found to be impracticable. This is provided with an additional scale giving the lighting values of the sky obscured by regular horizontal obstructions subtending

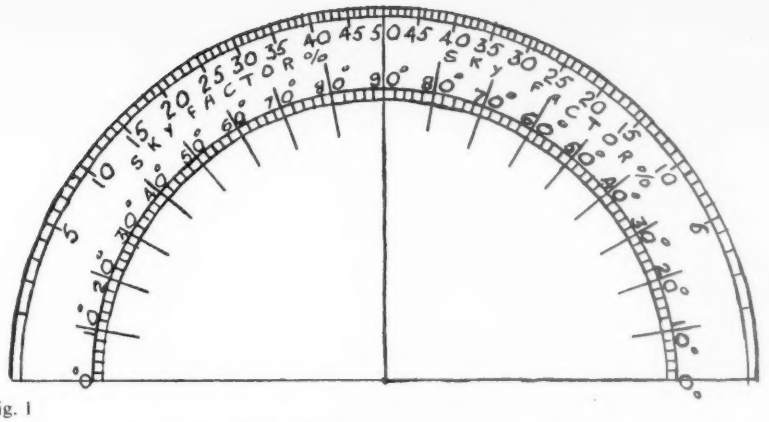


Fig. 1

given angles at the base of actual or potential window walls, which is the form in which future obstructions permissible under town planning are necessarily specified.

The Report mentions the use of, but unfortunately does not describe or illustrate, some new forms of protractor evidently intended to facilitate the difficult operation of averaging correctly the sky line of irregular obstructions. Problems in natural lighting are, however, seldom amenable to geometrical or instrumental short cuts because, as in street lighting problems, there is seldom room for general rules to operate between innumerable practical exceptions of infinite variety. It is therefore possible that most future practitioners will prefer the simple and obvious accuracy of plotting irregular obstructions on to ordinary daylight factor-measuring diagrams; an operation which is often, in fact generally, far less tedious than it is usually reported to be.

When this has been done, and the net sky factor obtained by simple measurement of

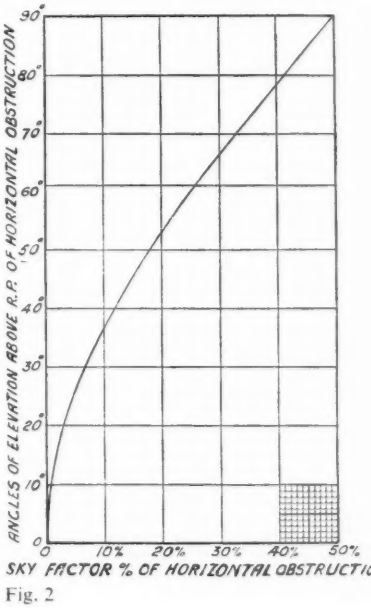


Fig. 2

areas, the equivalent continuous horizontal obstruction can at once be obtained from Fig. 1 for comparison with town planning restrictions on over-building.

Fig. 2 shows a more useful form of tool for the same operation in the form of a simple graph. As this merely represents the plotted values of the expression $1-\cos\theta \times 50$ when θ is the vertical angle subtended by the equivalent continuous horizontal obstruction *at the reference point selected*, it can be set out from any table of trigonometrical functions.

The words in italics are important, because the net effect of any vista of irregular obstructions comprising indentations and protruberances can differ most materially at different reference points which are not very far apart laterally.

Yours faithfully,

PERCY J. WALDRAM [*L*]

'THE KING IS IN HIS COUNTING HOUSE'—BOOK REVIEW

Sir,—I must write in regard to Mr. David Booth's review of my little book in the June JOURNAL. I thank him for his kindly approach. That is the way men should live together. I thank him also for his criticism which is so obviously competent and genuine.

I would lay emphasis on his first sentence and point out that it is a work envisaged from the architectural and historical point of view. Nobody is more fully aware of the omissions which are apparent if the proposals are read as if they were Town Planning proposals than I. Mr. Sharp will no doubt show us most ably how to town plan, and in so doing I hope he will accomplish the aspirations contained in my book, the main principle being the separation of the industry from the University. It appears that the over-simplification of the problem causes Mr. Booth anxiety as to the wisdom of producing such a book. I wish the public and technical men would take sufficient interest in the matter to justify this anxiety.

Yours faithfully,

THOMAS RAYSON [*F*]

*See article by Allen and Crompton in this JOURNAL.—Ed.

Book Reviews

The Black Country, by *Walter Allen* (Vision of England series, C. & A. Williams-Ellis, gen. ed.). 48 pp. + pls. + map, folded. Paul Elek. 9*s*. 6*d*.
This is partly topographical, partly architectural, partly sociological. The photographic plates give a fair selection of typical architectural survivals of various periods, and views showing the isolation and sordidness of the industrial part of the region, overlapping Staffordshire and Warwickshire; the text, with slight line and lithographed drawings by Malvina Cheek, emphasizes opportunely the characteristics of the various areas—south and east, west and north, and Birmingham; the city has a fair proportion of space. Briefly, the work is factual, and polemic by implication.

Report of Aslib meeting on planning and equipment of special libraries. 6th April 1946. 4to. pp. 33. London. The Association of Special Libraries and Information Bureaux. 1947. 3*s*. for members. 4*s*. for non-members.
A one-day conference on the planning and equipment of special libraries was held at the R.I.B.A. in April 1946. This report gives a digest of the four interesting papers given by K. Povey, W. Bonser and Verner O. Rees on the planning of university libraries and B. Fullman on libraries in research organizations and industrial concerns. Practical notes are added by E. J. Carter, late Librarian R.I.B.A.

Fuel Stores for Small Houses. 4to. pp. 24. The Coal Utilization Joint Council. 1947. 2*s*.
This booklet is intended as a guide for Local Authorities, architects and builders, to ensure that all new houses of the small subsidized type, likely to form the major part of the post-war building programme, are equipped with convenient, accessible and adequate fuel stores.

Various designs are shown, together with useful data on cost and accommodation.

Lead Industries Development Council. Bulletin No. 113. Report on Plumbing, Flats, Maisonettes, Conversion Work. Bulletin No. 115. Lead Sheet and Pipe. 4to. pp. 12. 1947.
The Lead Industries Development Council have been responsible for the publication of a number of information sheets and booklets giving technical information. These are freely available to architects, to whom they may be recommended.

Bulletin No. 113 deals with plumbing in multi-storey blocks of flats, in conversion work, to maisonettes, also with one-pipe system of disposal.

Bulletin No. 115 gives a brief account on lead as a material: historical notes, the metal, its alloys, sheet, pipe and technique of working.

Reconditioning in Rural Areas. Fourth Report of the Rural Housing Sub-Committee of the Central Housing Advisory Committee. 4to. pp. 48. H.M.S.O. 1947. 9*d*.
This Committee report includes sections on the need for rural reconditioning, availability of labour, scope and financial provisions for a new act, conditions under which grants or loans should be payable, the local authority for the purpose of a new Act, a complete programme for reconditioning, special reconditioning of houses of architectural or historic merit, major issues of policy. Appendices give useful data on rural housing statistics and a comparative table of the Provisions of the Housing (Rural Workers) Act with the recommendations of this Report.

Report of the Headquarters Commission to the Second Part of the First Session of the General Assembly of the United Nations. $12\frac{1}{2}+8$. pp. 143. Photographs 17. Maps 15. H.M.S.O. 1946. 10*s*.
This report, published by H.M.S.O., was prepared by the Commission created by the General Assembly, to examine in detail sites in New York and Connecticut with a view to their suitability as a permanent headquarters for the United Nations.

It contains 143 pages of text, with lavish illustrations, including 15 maps and 17 photographs. Detailed investigations of five possible sites are given, with basic criteria for the selection of sites, including airport and radio stations. A description is given of objections presented to the Headquarters Commission by local residents, and details of the land requirements for both offices and private dwellings for United Nations officials.

Värmeisolering och kondensering hos fönster (Heat-transmission and condensation of double windows), by *Per Nycander*. 4to. pp. 29. Stockholm: Statens Kommitté för Byggnadsforskning. 1946. Kr. 2.
Thanks to the Gulf Stream, double-glazed windows are seldom used in this country. This analysis of the problems of heat-transmission and condensation of double windows, and their dependence on the distance between the panes and on the ventilation between them, is however of value for its general implications. Written in Swedish, there is a full summary in English and the captions to the diagrams and details are also translated into English.

New Beginnings and New Towns, by *David B. Williamson*, with drawings by Fred Loebl. 4to. pp. 22. Town and Country Planning Association. 1947. 1*s*.
In this booklet, based on an address to the Lytton Club at Stevenage, the author puts forward the case for new towns from the viewpoint of the man in the street, rather than the professional planner. He briefly reviews a number of national problems: health, fuel, traffic congestion, education, juvenile delinquency, population and the use of leisure, and shows how a new town makes possible a positive approach in regard to these matters. The illustrations are undistinguished, but happily few in number.

Fonds Bibliotheque Albert I. R[apport] au Gouvernement sur ses travaux [depuis sa] constitution en 1935. 4to pp. 123. [Bru]xelles. 1946.
In 1935 it was decided that a [nat]ional memorial to King Albert I should [take] the form of a National Library. Com[pe]titions were held in connection with var[ious] sites under consideration, and finally in 1939 the Mont des Arts quarter of Bru[ssels] was chosen. This necessitated the prep[ara]tion of a general town planning scheme for this area, dealing with traffic, the imp[rov]ement of open spaces, vistas, functional requirements. The site, previously disfigured by assertive advertisements on exposed party walls where buildings had been demolished 40 years previously, had considerable architectural possibilities. The main layout was entrusted to M. Ghobert, while M. Houyoux was appointed architect for the Albert I Library. Drawings and models have been submitted, and it now remains for the Government to decide whether to accept the proposals and when work may start.

This report, written in both French and Flemish, gives a full account of the various steps taken in arriving at the scheme as it now stands. Illustrations include details of the more important units, with the layout plans and models, submitted in an interesting attempt to solve a problem which was by no means a straightforward one. The Library block is shown facing a monumental square, planted in an elaborate formal manner. It is doubtful, however, whether the destruction, so caused, of the existing informal well-wooded public gardens will be welcomed by the mothers of young children.

The Art of the French Book. Edited by André Lejard. $12\frac{1}{4}\times 9\frac{1}{2}$ pp. (iv) + 166 incl. pls. Paul Elek. 1947. £2 10*s*.
It is not so much the French book that we admire as the French Art in books. In England we have a conception of a book as the product of an exacting collaboration of craftsmen, each constantly aware of the demands of the others, so that the book itself can be considered as a collective work of art. This idea, championed by Morris in books of a special kind, has spread through the endeavours of a whole line of impresarios of the book into the field of cheap commercial production so that to us, now, neither the French novels falling to pieces on our shelves nor the French éditions-deluxe with their unbound sheets and separate portfolios of sumptuous illustrations and unique impressions are quite satisfactory as books. We tolerate the one for the sake of the writer and treasure the other as a container for the illustrator.

As Mr. Philip James says in his introduction to this volume, 'the art of the book in France is the inevitable triumph of the illustrator.' The beauty of the composed page is not our first concern here; we are lost in admiration of the masterly way in which French artists have seized on the possibilities of every advance in the techniques of printing and reproduction. But again 'illustration' admits of a French and an English

definitio n. It would not be a quibble to say that in France today it is not as an illustrator that the artist has triumphed, he has just forced himself whole between the covers of the book and sometimes, like a cuckoo, pushed the rest out. Bewick, Keene, Leech were illustrators, artists but specialists in illustration, their work faithfully mirrored the text (not always happily married to the type, and in this sense the French illustrator of the Romantic period could conscientiously and with great elegance and charm interpret 'Paul et Virgine' or 'Gil Blas'. In our time, among the great French artists, the non-specialists whom we meet so often in these pages, Maillol, a sculptor, has been a great illustrator by any standards and in every sense. In other cases we may feel that we are being presented with the work of the artist on a printed sheet merely as an alternative to seeing his work on the walls of a gallery. And magnificent it may be. From Boucher onwards nearly all the masters of French painting make their contribution. This book is not only for the use of scholars but for the delight of all lovers of French art.

It would be untrue, leaving it at that, to suggest that M. Lejard's team of experts can never show us periods when book production was unexceptionable. There were the illuminated manuscripts. There was also the 16th century when woodcut and type matched up, in the first 100 years of French printing, with a homely grace in detail and an unselfconscious beauty of balance in the whole never excelled by the more sophisticated research for harmony of later periods. The age of these lovely works of the early Paris and Lyons presses is well served by the illustrations, as indeed are the centuries of the illuminators and our own 50 years of great painter-illustrators of éditions-de-luxe.

A series of essays covers the history of book production and there is a chapter on bookbinding. Unfortunately the publisher has given us a very indifferent example of English bookbinding.

WILLIAM TOWNSEND

Gothic England: A Survey of National Culture, 1300-1550, by *John Harvey*. 8vo. pp. (xiv)+242. B. T. Batsford. 1947. 21*s*.

The great virtue of this attractive book is that it treats of architecture as art and the architect as artist. Construction, function, the availability of materials and general economics, all these enter into the *modus operandi* of building and help (or hinder) its development, but Mr. Harvey places none of them above the skill and genius that makes stone, brick and timber obey the artist's purpose. It is refreshing to leave the dark and dreary materialistic philosophy of architecture and find recognition of its supreme position in the national culture.

Mr. Harvey's theme concerns one of the most amazing achievements in the art of building and he is right in emphasizing its purely English provenance. The wonderful vehicle of æsthetic expression that was fashioned here in the 14th century and continued to have vitality through the 15th and early 16th centuries was a product of this country, a fact too little recognized. England produced, during the period, a widespread culture the meaning and beauty of which were the full possession of high and low alike. It touched the humblest things in life and also rose to the noblest heights. In the present age which vaunts its education no comparable culture exists, and certainly in building there is no common inspiration and therefore no articulate means of expression. To look through the abundant illustrations of this book, which have been chosen and presented with unusual skill, we are impressed by the immense resourcefulness of these Gothic builders, the richness of their architectural language and the magic quality of their achievement.

To the study of this great period of English art the author brings wide knowledge and solid scholarship. He writes with ease and handles his material skilfully, maintaining the human interest throughout. Apart from the general presentation his chief contribution to the subject is in lifting the veil of 'anonymity' which has so completely obscured the authorship of medieval design. He is betrayed, indeed, into an excess of anxiety to redress the balance and his attributions from stylistic inference (which, of course, have weight from so informed a judge) are so closely woven with those from documentary evidence that it is difficult to differentiate. Moreover it tends to obscure the fact that these supreme craftsmen did put their art first and their own part in it a long way after.

There is no doubt that this book gains much from the author's enthusiasm but on the larger issues one could have wished for less exclusive advocacy and greater breadth of view. To those who feel that the finest human expression is, and probably must be, cast in classical mould—a notion anathema to our author—medieval art is none the less a wonder and a delight. One is forced to doubt whether this exposition, learned and brilliant as it is, has really made us understand how the miracle came to be and why the artists wrought so well. Within the narrative the reader detects not a little inconsistency in the measure of victory and defeat apportioned to the spiritual and material forces of the times. But the sincerity and vigour of this survey of the crowded years of 'Gothic England' are as undoubted as the author's ability to present a worthy picture of its accomplishment. The book is bound to stimulate further study of a period of which we as a nation cannot be too inordinately proud. WALTER H. GODFREY [*F*]

Miniature Building Construction: An architectural guide for modellers, by *John H. Ahern*. 4to. pp. ix + 154. Percival Marshall & Co. 1947. 8*s*. 6*d*.

This book is not primarily intended for the architect who has models of architectural projects prepared to submit to clients. The author is more interested in the faithful reproduction of buildings and their surroundings in miniature, without any particular æsthetic discrimination; suburban villas, industrial premises, farms, railway buildings, garages, inns.

Notes and Notices

NOTICES

R.I.B.A. Roll of Honour

As a result of the publication of the R.I.B.A. Roll of Honour on pages 399 and 400 of the JOURNAL for June 1947, the following alterations have been notified and will be made:—

Additions

Atkin-Berry: Henry Gordon [*A*]
Bradley-Barker: Roger Bevan [*A*]
Perry: Norman [*A*]
Ronaldson: Patrick Henry Dudgeon [*A*]
Wrathmell: Tom Brian [*A*]
Cooper: Edward Priestley [*L*]
Douglass: Albert (Student)
Stantiall: Derick William (Student)

Deletion

Robertson: Alan Gerard [*A*]

Mr. Robertson, who was a Japanese prisoner of war, is now safe and well in Australia.

Correction

In the list of Associates: Wilson: Harry Ernest should read Wilson: Harold Edward.

Basis of employment and remuneration of nominated private architects in regard to schemes for M.N.I. buildings of a standard type which involve repetition units for the Ministry of Works

The conditions of employment and remuneration shall be in accordance with the Scale of Professional Charges issued by the R.I.B.A., as revised in 1946, so far as it is applicable to those services, subject to the following amendments:

(A) The work described in Clause 2(*a*) shall be remunerated:—

For standard Schemes, for which the Architect will be required to design the layout and drainage on the general lines of a type layout and supervise the erection of buildings to Ministry Type drawings.

Fees are to be calculated on the total cost of the Buildings, Drains, Roadwork and the Commissioner's items as under :—

3 per cent on the first £25,000.
2½ „ „ next £25,000.
2¼ „ „ residue.

(B) That the fee for partial services be charged in accordance with Clause 2(*e*) of the Scale but subject to the following amendments (i) and (ii) quantum meruit and (iii) as under:—

1 per cent on the first £25,000.
½ „ „ next £25,000.
¼ „ „ residue.

(C) (i) That the percentage charges are to be calculated on the total cost of each commission for which the Architect is responsible and which is covered by each letter of instruction including Commissioner's items but exclusive of any Special Works Services mentioned later, or, if the work be not carried out, on quantum meruit, or on the estimated cost thereof in accordance with Clause (B) of this memorandum.

(ii) Where Consultants are appointed for any Special Works Services by the Ministry of Works or in respect of Heating, Electrical and

other works carried out by the Ministry of Works' own Engineers, the Architect's fees shall be 1 per cent only on the cost of all works (exclusive of builder's work) upon which the services of the Consultants are retained or the Ministry of Works' own Engineers are employed.

(iii) Where it is agreed between the M.O.W. and the Architect that the Architect will himself be responsible for and will carry out all or part of the Special Works Services:

(1) with his own Engineering Staff (if approved by the M.O.W.);

(2) by himself appointing and paying an approved Consultant.

The Architect shall be paid, in addition, a fee as under, on the cost of the Engineering Services upon which he employs his own Engineering Staff or upon which the Services of his own Consultant are retained, to enable him to discharge these liabilities:—

3	per cent on the first £25,000	on the cost of Engineering Services.
2½	,, ,, next £25,000	
2¼	,, ,, residue	

(iv) That for services referred to in Clause 2(*h*) of the Scale, the charge to be based on the time occupied at the following rates:—

Principal's time, £7 7s. a day.
Senior Assistant's time, £3 13s. 6d. a day (for Assistants receiving £8 8s. a week upwards).
Junior Assistant's time, £2 12s. 6d. a day (for Assistants receiving up to £8 8s. per week).

(D) The Architect shall on the acceptance of the tender supply to the Ministry of Works negative drawings, in ink on linen of the following:

(i) The layout plan.

(ii) The ¼in. scale working drawings so far as the standard drawings require any alterations, additions or adaptations, to a specific site.

(iii) The Architect shall, at the completion of the work, supply to the Ministry of Works a negative drawing in ink on linen of the layout plan as finally carried out showing the main lines of the drainage and other essential services, together with any major amendments to the working drawings which have been made during the carrying out of the work.

(iv) The Architect will supply all the drawings, whether prepared by himself or issued by the Ministry, to the parties concerned under his control which are necessary for the carrying out of the works.

(E) (i) The Architect shall not give instructions for works under 1(*e*) of the R.I.B.A. Scale where the cost may exceed £100 without prior approval of the Ministry of Works.

(ii) The Architect will be required to agree with the Contractor time and progress schedules and to furnish weekly reports in such a form as the Ministry of Works may require. The standard form of these reports requires a statement as to any variations in cost from time to time.

(F) For the application of Clause (8) Expenses. Travelling expenses and subsistence allowances will be paid on the basis of the scale laid down for Architects of the Ministry of Works which will be sent to the Architects at the time of their employment. No other disbursements such as cost of appliances, copies of documents, lithography, drawings, etc., will be chargeable under expenses.

(G) The above scale is computed on the understanding that the Ministry of Works will supply to the Architect, in addition to the usual instructions, standard drawings for his use. In the event of any dispute arising between the Ministry of Works and the Architect as to the interpretation of the Scale of matters arising therefrom, such dispute shall be referred to an Arbitrator appointed by the President of the R.I.B.A.

Cessation of Membership

Under the provisions of Bye-law 21 the following has ceased to be a member of the R.I.B.A.

As Associate

Stanislaus Roarty

Election, 9 July 1946

The election of Major C. Harold Heathcote, T.D., as a Fellow, which was announced in the August, 1946, JOURNAL has been declared void.

BOARD OF ARCHITECTURAL EDUCATION

The R.I.B.A. Intermediate Examination. May 1947.

The R.I.B.A. Intermediate Examination was held in London, Manchester, Leeds, Newcastle, Edinburgh, Belfast and Cardiff from the 16 to 22 May 1947.

Of the 394 candidates examined, 192 passed and 202 were relegated. The successful candidates are as follows:

Abbott, L. A.
†Abraham, M. (Miss)
Aldridge, G.
Ames, G. G. S.
Andrews, A. W. K.
Annandale, D.
Aylwin, J. M. M. (Miss)
*Ayres, A. W.
Ayton, F. H.
Badger, R.
Baird, R. L. J.
Balcombe, G. H.
Bamford, G. S.
Barker, G. C.
*Barnes, H. S.
Barnett, N. J.
*Bates, T.
*Beardsworth, N. F.
Bedford, A. C.
Belcher, D. A. (Miss)
Berger, B. S. D.
Bettison, J.
Biley, D. E.
Bond, F. A.
*Bourne, C. J.
Bourne, E. M.
Bowering, F. J.
Bridger, M. A.(Miss)
Brown, P. J.
Brown, W. N.
*Burch, C. E.
Burgess, R. G. W.
*Burrell, J. A.
Butcher, G. O.
*Butler, P. H.
Caldecott, E. M. (Miss)
*Carpenter, L. W.
*Carter, G.
Chalton, J. K.
Chapman, J. R. N.
Coakham, G. D. G.
Cohen, G. J.
*Collins, S. F.
Copcutt, G.
*Corby, E. R.
*Corless, R. B.
Cousins, P. G.
Craven, K. W.
Cull, D. A.
Cummings, E. A.
Dando, L. C.
*Daniels, L.
Dart, C. J.
Davidson, A. G.
Davidson, W. M.
Day, A. C.
Delany, F.
Dixon, M. G.
Duncan, G. P.
Eales, D. J.
Elter, F.
Englefield, G. S.
Falkus, D. T. F.
Fielding, R. H.
Fleming, E. R.
Ford, J. A.
Foster, John
*Fox, J. R.
*Frost, Kenneth
Fullman, Trevor
Galbraith, W.
Galloway, D.
Gilmour, W. J.
Glanfield, J. R.
*Godfrey, G.
Goff, J. F.
Gundry, P. B. H.
Hadfield, J. C.
Hampton, A. S.
Hanna, M. E.
*Harrison, R. E. G.
Hayler, M. E.
Heptonstall, D.
Herd, R. D.
Hewitt, B. M.
Hickman, D. R.
Hill, D. B.
Hollamby, E. E.
*Hollingsworth, G. F. L.
Hollow, J. A. R.
Holmes, A. B.
Holmes, J. C.
Holt, Colin
Holt, M. E.
*Hooper, J. D.
Hothersall, G. L.
Hounsell, R. L.
Hudson, J. R. H.
Humby, H. J.
*Humphreys, J. R. B.
*Jackson, G. C.
*Jackson, G. W.
*Jay, R.
Johnson, H.
Johnston, H. N. T.
Jones, E. M. (Miss)
Kershaw, S.
Kett, B. D.
King, Harold
Knight, P. H.
Knowles, J. E.
Lambeth, D. F.
Lancaster, F. H.
Langrick, A.
Law, John
Leadbeater, G. M. (Miss)
Leith, C. R.
Lewis, T. W. G.
*Lingard, B. H.
Lowe, R. Hutton B.
*McAlister, W. H.
McCaughey, V. C. C.
*McCulloch, R.
*Mackenzie, S.
MacRitchie, A. C. C.
Malloch, A. T.
Malton, J. V.
Marsh, H. G.
Massey, G. W.
Matchett, G. A.
*Montgomerie, H. G.
Moore, C. W.
*Mowbray, P. G.
Nicol, P. A. (Miss)
Norrish, K. V.
Nuttall, F. R.
Partridge, J. A.
Paton, James
Peck, M. H.
*Pegg, G. M.
*Pimblott, A. T.
Powell, John
*Price, R. M.
Purkis, A. E.
Randall, W. R.
Ratcliffe, A. F.
Reid, Robert
Renninson, P. T.
*Richards, D. F.
Ridgewell, P. H.
*Ridsdale, R. O.
Robertshaw, J. A.
Rowe, J. S.
Sampson, [illegible] H.
Sedgwick, [illegible] D.
Shaw, K. V.
*Smith, Colin J. S.
*Smith, Douglas D.
†Smith, Douglas J.
Smith, John [illegible].
*Smith, Stanley F.
Sparry, R. C.
Stainer, M. [illegible] (Miss)
Stanford, [illegible] H.
Steele, Thomas
Stirrat, W. C.
Stone, P. R.
Stones, R. N.
Tandy, C. R. V.
Tate, R. G.
*Taylor, Robert
*Tench, G. D.
*Turner, R. E.
Vale, D. R.
*Vinter, Tom
Waddington, S.
*Waldron, E. W.
Walker, R. P.
Warner, J. H.
*Waters, G. W.
Watson, L. H.
*Watts, Dennis
*Whalley, M.
*Wilkinson, John
Williams, P. L. A.
*Williamson, J. F.
Wilson, Charles H.
*Wilson, Harry
*Woodford, E. R. R.
Wright, Charles A.
Yates, A. J.
Young, Gordon

*Subject to approval of History Thesis or Theses.

†Subject to approval of remaining Testimonies of Study.

The following candidates have also completed their qualifications and have now passed the Intermediate Examination:

Robinson, Anthony A.
Berryman, A. A.

R.I.B.A. Soane Medallion Competition

In the United Kingdom 66 competitors took part in the Soane Medallion en loge Competition, and the following competitors have been selected to proceed with the final drawings for the competition: Mr. David A. Breese (Liverpool School of Architecture), Miss Pamela F. Burcher (School of Architecture, The Polytechnic, Regent Street, London), Mr. Robert T. Clough (Leeds School of Architecture), Miss Esmee M. S. Cousin (Glasgow School of Architecture), Mr. David M. Goodacre (Nottingham School of Architecture), Mr. John P. J. Jackson (School of Architecture, The Polytechnic, Regent Street, London), Mr. William F. Mullins (Architectural Association School of Architecture), Mr. John E. Murray (Glasgow School of Architecture), Mr. Donald A. Pate (Liverpool School of Architecture), Mr. Ian W. Paterson (Aberdeen School of Architecture), Mr. Charles W. Quysner (School of Architecture, University of Manchester), Mr. Fred Rogerson (Liverpool School of Architecture), Mr. William Smith (School of Architecture, King's College, Newcastle-upon-Tyne).

R.I.B.A. Maintenance Scholarships in Architecture

The Royal Institute of British Architects announce that the following Maintenance Scholar-

ships have been awarded for the year 1947–1948:—

An R.I.B.A. Houston Maintenance Scholarship of £125 per annum to Mr. D. N. Sutcliffe of Welwyn Garden City, Herts.

An R.I.B.A. 4th and 5th Year Maintenance Scholarship of £60 per annum to Mr. Albert McConnachie of Insch, Aberdeenshire.

An R.I.B.A. Howe Green 4th and 5th Year Maintenance Scholarship of £40 per annum to Miss Ruth Pocock of London.

The Maintenance Scholarships previously awarded to the following candidates have been renewed:—

Mr. H. W. D. Burgess (Welsh School of Architecture, The Technical College, Cardiff. R.I.B.A. Houston Maintenance Scholarship of £125 per annum).

Mr. J. M. Phillips (Bartlett School of Architecture, University of London—R.I.B.A. Houston Maintenance Scholarship of £125 per annum).

Mr. A. J. Mellor (Bartlett School of Architecture, University of London—R.I.B.A. Howe Green 4th and 5th Year Maintenance Scholarship of £40 per annum).

Mr. E. Sheard (School of Architecture, King's College, Newcastle-upon-Tyne — R.I.B.A. "Builder" Maintenance Scholarship of £60 per annum).

R.I.B.A. Prize and Studentships—Mounting of Drawings

The attention of intending competitors is drawn to item No. 3 of the General Conditions. In view of the difficulty of obtaining material for mounting drawings it has been decided to waive this regulation for the Prizes and Studentships offered for award this year.

Exhibition of Drawings submitted for the Archibald Dawnay Scholarship 1947

The works submitted by candidates for the R.I.B.A. (Archibald Dawnay) Scholarships will be on exhibition at the Royal Institute of British Architects, 66 Portland Place, London, W.1. from Monday 8 September to Monday 15 September 1947 inclusive. The exhibition will be open between the hours of 10 a.m. and 7 p.m. (Saturday 10 a.m. and 5 p.m.). The Scholarships are intended to foster the advanced study of all forms of construction, and are tenable at the Schools of Architecture recognized for exemption from the examinations of the Royal Institute.

COMPETITIONS

COMPETITION RESULT

Bessingby Housing Estate, Bridlington.

1. Messrs. Culpin and Son [*F*].
2. Messrs. Eric Cole and Partners [*F.F.*].
3. Mr. N. Dickenson [*A*] and Mr. D. H. Rowledge [*A*].

ALLIED SOCIETIES

Allied Societies. Changes in Officers and Address

Hampshire and Isle of Wight Architectural Association, including the Channel Islands. Society Headquarters, 39 Portland Terrace, Southampton. Secretary: Mrs. Rita A. Irving, 39 Portland Terrace, Southampton. Central Chapter:—Honorary Secretary: H. G. Hayter [*L*], 45 Westwood Road, Southampton.

North Wales Architectural Society. President: Mr. P. M. Padmore [*F*], "Whilome", Llanfairfechan; Vice-President: Mr. R. Parker, M.C. [*A*]; Hon. Secretary: Mr. F. C. Roberts, B.Arch., Earl Chambers, Mold, N. Wales; Hon. Treasurer: Mr. F. A. Roberts [*F*].

Blackpool and Fylde Architectural Society. Mr. Halstead Best [*F*] has resigned the Presidency of this society. His successor has not yet been elected.

Northern Architectural Association, Tees-Side Branch. Chairman: Mr. John A. Senior [*L*], 'Glenholme', 2 Stanley Grove, Richmond, Yorks (Richmond 2266); Hon. Secretary: Mr. P. F. Burridge [*F*], Borough Architect, National Provincial Bank Chambers, 124 High Street, Stockton-on-Tees.

East Africa Institute of Architects (P.O. Box 866, Nairobi, Kenya). President: Mr. C. T. Mitchell [*F*]; Vice-President: Mr. G. B. E. Norburn [*F*]; Hon. Secretary and Treasurer: Mr. J. R. Turner, whose address is shown above.

Institute of Southern Rhodesian Architects, Salisbury, S. Rhodesia. President: Mr. W. E. Alexander [*A*], Box 396, Bulawayo; Vice-President: Mr. J. J. Beaton, Secretary and Registrar: Mr. E. P. Venables, P.O. Box 1129, Salisbury.

Architectural Association Prizes and Scholarships Awards

First Year Prizes: Howard Colls Travelling Studentship (value £15 15*s*): R. E. Wilkinson; Second Prize (Books, value £5 5*s*.): L. H. Nixon. *Second Year Prizes:* A.A. Travelling Studentship (value £26 5*s*.): J. M. Rogers, W. J. G. Godwin. Second Prize (Books, value £10 10*s*.): H. C. Morris. *Third Year Prizes:* Holloway Scholarship, tenable for the senior course (value £150): P. A. Newnham; Third Year Travelling Studentship (value £31 10*s*.): R. H. Sims; Third Prize (Books, value £10 10*s*.): B. M. Feilden. *Fourth Year Prizes:* Year Prize (Books, value £10 10*s*.): P. A. R. Dickinson; R.I.B.A. Henry Jarvis Scholarship for Construction (value £50): M. G. F. Ventris. *Fifth Year Prizes:* Henry Florence Travelling Studentship (value £50): J. N. Graham; Fifth Year Travelling Studentship (value £50): L. E. Martin; Third Prize (Books, value £10 10*s*.): H. M. Tardrew. *Medal* presented annually by the Société des Architectes Diplomés par le Gouvernement, Paris, to the best Diploma student of the Session: D. P. Goldhill. *Alec Stanhope Forbes Prize* (for the best colour work during the Session) (Books, value £5): S. Gardiner. *A.A. Essay Prize* (Books, value £10 10*s*.): C. G. L. Shankland. *A.A. Measured Drawings Prize* (value £20): B. M. Feilden. *Royal West of England Academy School of Architecture* (affiliated to the A.A.): The Prize in Design (value £5 5*s*.) is awarded to Miss V. R. Harrison.

During the Session the following awards were announced: *Leverhulme Scholarship* (value £1,000): J. M. Keable. *The Minter Open Entrance Scholarship* (value £90): D. F. Clayton. *The Sir Walter Lawrence Open Entrance Scholarship* (value £90): C. P. Sainsbury. *The Metal Window Scholarship* (value £75 p.a.): G. F. Fowler. *The Natural Asphalte Council Scholarship* (value £50 p.a.): T. G. Bidwell. *The Northern Aluminium Scholarship* (value £50 p.a.): J. M. Broughton. *The Patent Glazing Scholarship* (value £50 p.a.): Miss P. Bowden.

Award to be announced later: *The Metal Window Senior Scholarship* (value £50 p.a.).

The following Scholarships have been renewed for a further year: *Leverhulme Scholarship:* R. H. Sims, W. J. G. Godwin, P. J. Lord. *The Minter Open Entrance Scholarship:* R. G. Harris, Miss J. R. Butler. *The Sir Walter Lawrence Open Entrance Scholarship:* H. C. Morris. *The British Plywoods Senior Scholarship* (value £50 p.a.): L. E. Martin. *The Cement and Concrete Association Scholarship* (value £50 p.a.): M. D. Willis. *The Ejma Scholarship* (value £75 p.a.): J. A. C. Higgins. *The Metal Window Scholarship:* A. J. Ault, Miss D. R. Leigh. *The Natural Asphalte Council Scholarship:* D. H. Hiscock. *The Northern Aluminium Scholarship:* J. S. Ambrose, S. J. Holderness. *The Patent Glazing Scholarship:* W. J. Appleton, Miss S. R. Tindale. *The Pilkington Scholarship* (value £75 p.a.): T. de Pont Davies.

Annual Convention of Royal Incorporation of Architects in Scotland

Sixty delegates attended the R.I.A.S. 31st annual convention at Stirling on 20 and 21 June. The proceedings opened with the annual general meeting in the Municipal Buildings on Friday afternoon 20 June, when the President, Mr. A. Graham Henderson [*F*], of Glasgow, occupied the chair and delivered his valedictory address. Mr. A. G. R. Mackenzie [*F*], of Aberdeen, was unanimously elected President for the ensuing year. The delegates were then accorded a civic reception by Provost A. M. McMichael, J.P., M.A. [*F*].

The convention dinner was held at the Golden Lion Hotel in the evening and the newly-elected President occupied the chair. After 'The King' and 'The Founder' had been honoured, the toast of 'The Town and Trade of Stirling' was submitted by Mr. Lockhart W. Hutson, O.B.E. [*F*]. Dealing at the outset with the history of the Burgh, Mr. Hutson went on to say that Stirling had built up a tradition not only in that sphere but in architecture. Provost McMichael, responding, thanked Mr. Hutson for his kind remarks about Stirling and assured the company that the maintenance of the traditions, beauty, and old-time characteristic architecture of Stirling were 'in good hands' in the present Town Council. 'The Architectural Profession' was proposed by Mr. H. A. Brechin, F.S.I., Senior Vice-Chairman of the Royal Institution of Chartered Surveyors (Scottish Branch) and was responded to by the R.I.B.A. President, Sir Lancelot H. Keay, K.B.E., and briefly acknowledged by Mr. Mackenzie.

Sir Lancelot Keay said it was the business of leaders of the architectural profession to see that they turned out into the world today—a practical world—men who were both artistic and practical. The two could and must go together. There was no room in the world at present for the mere theorist. 'The Guests' was the toast given by Mr. A. Graham Henderson [*F*], past President, R.I.A.S., and it was replied to by Sir George Stirling of Glorat, Bt., C.B.E., D.S.O., Lord Lieutenant of the County of Stirling. 'The Chairman' was toasted on the call of Mr. Robert Wilson [*A*], President of the Stirling Chapter of Architects.

On Saturday 21 June, the delegates visited the Church of the Holy Rude and Stirling Castle and lunched at Dunblane Hydro as the guests of the Stirling Chapter.

GENERAL NOTES

Cricket: R.I.B.A. *v.* Blue Circle C.C.

The R.I.B.A. played the Blue Circle Cricket Club on the latter's ground at Snaresbrook on 27 July 1947. In spite of the heavy defeat of the R.I.B.A. by 9 wickets the players and spectators enjoyed a perfect day's cricket and a most excellent lunch and tea. Mr. D. S. Taylor captained the R.I.B.A. side, won the toss, and decided to bat. The R.I.B.A. fared extremely badly against the accurate bowling of Mr. Jeffries and Mr. Reiss and were all out before lunch for 64 runs. The only bright interlude was a useful stand for the sixth wicket between Mr. A. E. Bartholmew and Mr. B. S. Smyth, who carried his bat for an invaluable and well compiled 24 runs. Throughout the afternoon the Blue Circle batted steadily and having passed the R.I.B.A. score for the loss of only one wicket went on to make 187 runs. The fielding of the R.I.B.A. was always keen and the

highlight was a brilliant catch by Mr. G. R. Linfield off his own bowling. Mr. C. A. R. Norton was the most successful bowler taking 6 wickets for 53 runs. After tea the R.I.B.A. batted a second time and made 94 runs for the loss of 3 wickets, Mr. A. Marlow scoring a bright 43 runs, which included 8 boundaries.

We should like to take this opportunity of thanking the Blue Circle Cricket Club for their hospitality which we hope to be able to return next year.

Score:

R.I.B.A. 1st Innings.	
R. Davison b Jeffries	10
A. Marlow c Shelley b Jeffries	6
C. A. R. Norton c Clark b Reiss	0
R. R. Fairbairn b Reiss	1
B. S. Smyth not out	24
D. S. Taylor c Oliver b Reiss	0
A. E. Bartholomew run out	9
G. R. Linfield b Jeffries	0
D. Farrington b Jeffries	0
J. A. Farquahar c Steel b Jeffries	4
J. M. Wheeler b Jeffries	0
Extras	10
Total	64

Bowling
Reiss 3—26. Jeffries 6—22. Cartwright 0—6.

R.I.B.A. 2nd Innings.	
R. Davison lbw b Wood	13
A. Marlow c Oliver b Jeffries	43
C. A. R. Norton b Reiss	27
R. R. Fairbairn not out	8
B. S. Smyth not out	3
Extras	0
Total (for 3 wickets)	94

D. S. Taylor, A. E. Bartholomew, G. R. Linfield, D. Farrington, J. A. Farquahar and J. M. Wheeler did not bat.

Bowling
Reiss 1—9. Jeffries 1—24. Wood 1—27. Grove 0—17. Cartwright 0—17.

Blue Circle C.C.	
A. C. Clark lbw b Norton	46
G. Lewis c Bartholomew b Norton	9
S. J. Slaughter c Bartholomew b Norton	27
J. Reiss c Smyth b Linfield	41
S. Jeffries lbw b Norton	0
J. E. Grove b Norton	0
A. Oliver c Norton b Smyth	10
J. Shelley b Farrington	34
A. L. Steel c and b Linfield	4
W. J. Cartwright b Norton	8
F. E. Wood not out	6
Extras	2
Total	187

Bowling
Norton 6—53. Farrington 1—33. Linfield 2—42. Smyth 1—57.

R.I.B.A. Golfing Society v. L.M.B.A. Golfing Society—At West Hill Golf Course, 9 July 1947

Singles—Note L=L.M.B.A.; R=R.I.B.A.

D. L. Courtney (L) beat E. H. Firmin (R) by 5 and 4, P. H. Bates (L) beat F. Lassey (R) 2 and 1, F. R. Clements (L) beat Sir G. G Scott (R) 3 and 2, F. R. Leadsom (L) beat W. R. F. Fisher (R)* 4 and 3, G. Ibbetson (L) beat J. Grey (R) 1 up, S. Marshall Andrew (L) beat W. R. F. Fisher (R)* 4 and 3, H. T. Townsend (R) beat D. F. Cox (L) 3 and 2, H. L. Hartley (L) beat A. D. Coward (R) 2 up, A. V. Farrier (R) beat A. J. Bates (L) 3 and 1, R. E. L. Mabey (L) beat L. C. Veale (R) 8 and 6, L. Dobbs (L) beat F. T. Smith (R) 2 up, E. L. V. Dakin (L) beat W. E. Watson* (R) 9 and 7, W. Carmichael Mason (L) beat W. E. Watson (R)* 6 and 4. Totals L.M.B.A. 11, R.I.B.A. 2. *Three ball matches.

Four Balls—Note L=L.M.B.A., R=R.I.B.A. Dobbs and P. H. Bates (L) beat Lassey and Smith (R) by 2 up, Firmin and Scott (R) beat Courtney and Clements (L) 3 and 2, Farrier and Townsend (R) beat A. J. Bates and Cox (L) 3 and 1, Fisher and Grey (R) beat Leadsom and Ibbetson (L) 3 and 1, Hartley and Dakin (L) beat Coward and Watson (R) 3 and 2 Carmichael Mason and Marshall Andrew (L) beat Veale and Goldsmith (R) 5 and 4. Totals L.M.B.A. 3, R.I.B.A. 3.

Royal Academy School of Architecture

The Royal Academy School of Architecture is a day school for 10 students who have taken a British University degree in Architecture or have passed the final examination of the Royal Institute of British Architects.

Qualified students may be accepted for an advanced course of training comprising an intensive study of civic architecture and the preparation of designs for buildings of national importance. The course is for one year and is gratuitous. The students will compete each year for a Royal Academy Grand Prize of £300, and a Second Prize of £150 presented by The Lord Fairhaven.

Students who wish to take this course should apply to the Secretary, Royal Academy of Arts, Piccadilly, W.1, stating their age and qualifications, and should send with their application a portfolio of studies and designs on Monday or Tuesday 14 or 15 July 1947.* Selected candidates will be invited to an interview with Professor A. E. Richardson, R.A., Director of the School.

**Received too late for publication in July* JOURNAL—*Editor.*

School of Planning and Research for Regional Development Examinations

The following are the successful candidates in the examinations at the end of the six months of the three months Completion Courses in Town and Country Planning at the School of Planning and Research for Regional Development, 34/35, Gordon Square, W.C.1. The course is open to men and women from the Forces, who have reached a required standard in the War Office Correspondence Course. Success in the examinations entitles the candidates to professional membership of the Town Planning Institute subject to a period of practical experience and certain professional qualifications.

Distinctions were obtained by: G. H. Samuel, M.A. [*A*]; F. S. Knight [*A*]; R. W. Rose, A.M.Inst.Mun.E.; R. W. Leggatt [*A*].

Other successful candidates were: T. W. Atkinson [*A*]; K. H. Baruth; G. L. Burke, B.Sc; G. V. Charles [*A*]; D. S. Craig [*A*]; J. B. S Dahl [*A*]; P. A. Deane, M.A. [*A*]; I. G. Dunn [*A*]; A. M. Edwards [*A*]; V. W. Fishwick [*A*]; A. L. Gabites [*A*]; R. W. Gray [*A*]; R. D. Hammett [*A*]; A. E. Howard, B.Sc.; L. T. B. Kealey, B.Eng.; A. D. Knapton [*A*]; J. S. Lacey [*A*]; J. Lankester; K. Linden [*A*]; L. V. Mitchell [*A*]; W. Morris [*A*]; F. Murray; R. M. W. Norris; R. J. Soper, M.Eng.; J. D. M. Taylor, M.A. [*A*]; C. G. Trimmer; N. L. Vosper, B.Arch. [*A*]; I. F. Warwick [*A*]; D. A.S Webster, M.A.(Arch.) [*A*].

Southern College of Art (Portsmouth Centre) Certificates and Scholarships

Awarded Certificate in Architecture (exempting from R.I.B.A. Intermediate Examination): R. G. Robbie, A. C. Parnell, P. J. Coles, Ann Livingston, R. F. Adams, D. H. Lawrence.

Awarded Certificate in Architecture subject to approval of History of Architecture Theses (General and Special) by R.I.B.A. Examiners: M. W. Turner.

Partial Exemption R.I.B.A. Intermediate Examination: A. P. Warren.

History of Architecture (General and Special); Mechanics III: E. Crockett.

Awards: R. G. Robbie: Awarded Scholarship by the Architects' Registration Council of the U.K., to the value of £100; R. F. Freemantle: Awarded Scholarship by the Hants and Isle of Wight Architectural Association for 1947 (value £40); R. Dolan: Awarded First Prize (£8 8*s.*) in National Pitched Roofing Council Competition 1947; S. T. Sandwell: Awarded Second Prize (£5 5*s.*) in National Pitched Roofing Council Competition 1947; A. T. Baker: Awarded Third Prize (£2 2*s.*) in National Pitched Roofing Council Competition 1947.

Notes from the Minutes of the Council

MEETING HELD 8 JULY 1947

Appointment:

Royal Netherlands Institution of Engineers Centenary Celebrations: R.I.B.A. Delegate: Mr. W. M. Dudok (Hon. Corresponding Member).

National Playing Fields Association: Grounds and Lay-out Committee: R.I.B.A. Representative: Mr. W. H. Ansell, Past President.

General Council for the National Registration of Plumbers: Annual Conference, Edinburgh: R.I.B.A. Representative: Mr. A. H. Mottram [*F*], President of the Edinburgh Architectural Association.

Codes of Practice Committees:

R.A. Drafting Committee: Mr. C. E. Culpin [*F*] in place of Mr. C. M. Vine [*A*].

Drafting Committee 3: Mr. C. J. Epril [*F*] in place of Mr. F. H. Durant [*Retd. L*].

B.S.I. Committees:

Conference to consider Truck Mixed Concrete: Mr. A. H. Barnes [*F*].

ISE/13—Standard Steel Sections: Mr. T. Ritchie [*F*].

CEB/6 Cast Concrete Products, CEB/6/1 Concrete Blocks, CEB/6/2 Concrete Tiles, CEB/6/4 Concrete Kerbs and Flags, CEB/6/9 Concrete Floor Tiles, PVC/1/2 Cement, Concrete and Magnesium Oxychloride Compositions, STB/2 Concrete Aggregates: Mr. Ernest Seel [*A*].

TIB/1/1 Drafting Committee on Timber Grading, TIB/5 Use of Timber in Building Construction, TIB/5/1 Timber Programme Committee: Mr. Percy Waldram [*L*].

Committee on Modular Planning: Mr. R. L. Davies [*A*.]

National Consultative Council of the Building and Civil Engineering Industries

The Council have re-appointed Mr. M. Waterhouse, Vice-President, and Mr. T. Cecil Howitt [*F*], as the R.I.B.A. representatives for the year ending 1 July 1948.

School Planning and Construction Lectures

The Council approved the proposals to hold a special course of lectures on School Planning and Construction at the R.I.B.A. on 23 and 24 October.

Full particulars of the lectures are mentioned on Page 489, and the provisional programme is as follows:

Thursday 23 *October* 11 a.m. 'Secondary Schools' by Mr. Denis Clarke Hall [*F*], Discussion.

1 p.m. Lunch.

2.30 p.m. Address by the Rt. Hon. George Tomlinson, M.P., Minister of Education. 'Nursery, Infant and Junior Schools' by Mr. John Harrison [*A*], Discussion.

Sir Lancelot Keay will be in the Chair this day.

Friday 24 *October* 10 a.m. 'Standard and Quality of Lighting' by Mr. William Allen [*A*], Discussion.
11.30 a.m. 'Heating and Ventilation' by Mr. C. C. Hindisyde [*A*], Discussion.
1 p.m. Lunch.
2.30 p.m. 'Acoustics' by Mr. Hope Bagenal, D.C.M. [*F*], Discussion.
4 p.m. 'Use of Materials' by Mr. Robert Fitzmaurice, B.Sc. (Eng) [*Hon. A*], Discussion.

Mr. H. S. Goodhart-Rendel, M.A., Past President, R.I.B.A., will be in the Chair in the morning on this day and the President, Sir Lancelot Keay in the afternoon.

Membership: The following members were elected: as Fellows, 6; as Associates, 23; as Licentiates, 22.

Election: 14 October and 9 December 1947: Applications for election were approved as follows: as Fellows, 5; as Associates, 35; as Licentiates, 10. From Overseas Members: as Fellows, 1; as Associates, 2. Students: 19 Probationers were elected as Students.

Applications for Reinstatement: The following applications were approved: as Associates: William John Roberts [*Retd. A*], Arthur Ammerman Stewart, Francis George Dudley Stone.

Resignations: The following resignations were accepted with regret: George Gordon Macfarlane [*F*], Alexander Cochran Denny [*A*], Walter Roy Thomson [*A.*] Marcus Oswald Type [*A*], Harold Linley Bown [*L*].

Applications for Transfer to Retired Members' Class under Bye-law 15: The following applications were approved: as Retired Fellows: Charles Edward Bateman, John Camplin Farrer, Robert Ridley Kitching; as Retired Associates: Albert George Westerman Allen, Tilleard Horace Osman Collings, Thomas Wallis Gordon; as Retired Licentiates: Reginald Francis Guy Aylwin, Henry Charles William Blyth, Henry Howitt Bridgman, William Edward Crabtree, Frank Cremer.

Obituaries: The Secretary reported with regret the deaths of the following members:
Frank Conger Baldwin (Hon. Corresponding Member).
Harold Edgar Jarvis [*F*].
Bernard Joseph McAdam [*F*].
Christopher Henry Mason Bompas [*A*].
James Alfred Grundy [*A*], Killed on Active Service.
Henry Horace Gaskell Denvil [*L*].
Alan Kettle [*L*].

Obituaries

Lord Lee of Fareham [*Hon. F*] died on 21 July. He was born at Bridport in 1868 and enjoyed a distinguished army and public career. The world of art and culture owed much to this noted public servant. In 1923 he personally organized the Exhibition of British Primitive Painting at Burlington House and was a Trustee of the Wallace Collection since 1924 and of the National Gallery from 1926-33. Lord Lee was a Member of the Royal Fine Art Commission since 1926 and its Deputy Chairman since 1940, as well as being chairman of the management committee of the Courtauld Institute. He was elected an Honorary Fellow of the R.I.B.A. in 1926. His public benefactions are legion, the most noteworthy being the gift of the Chequers Estate to the Nation in 1921.

Professor A. E. Richardson, R.A. [*F*] has sent the following appreciation of Lord Lee of Fareham:

It is a sad duty to sit down in the quiet of a study to attempt a tribute to a man of such wide attainments as the late Lord Lee of Fareham. For one has to contemplate a many-sided personage at once, statesman, scholar and patron of the arts. It is not lack of facts that makes the task a difficult one, on the contrary reminiscences crowd in plenty before the mind, but it is infinitely more important to sketch a portrait which bears some likeness to the original than to indulge in fulsome praise.

Public service was his most notable achievement, and this was associated with every stage of his long and supremely active career. Unlike the architect, the painter, or the sculptor, a statesman leaves little tangible evidence of his life's work. You cannot say that such a one excelled in this or that, for visual results are not apparent. On the side of education and scholarship there is the abstract contribution of teaching and research, both of immeasurable value. But the effects of both are often spread over years of toil, are in fact integral with university life and can only be identified in the long list of those who have profited by the example of the teacher.

A man's attitude to Art perhaps reveals his soulful character in a more direct way. He either possesses taste or he is devoid of that perception of beauty which creates similar enthusiasm in the minds of others. It is the sum total of these activities which constitutes a true memory, of which all men of culture might be envious. It is rarely given to one person to impress his fellows with his own genius and taste in art matters, but there are of course rare exceptions.

These tentative decisions are merely individual impressions and as such are open to criticism. They are, however, prompted by many personal contacts and the privilege of sharing some of the lesser tasks.

For this humble and natural reason all pretentions to state more than impressions must be put aside. To me Lord Lee stands for wise and discriminating patronage of the Arts. He reverenced history, held profound opinions on masterpieces of painting, balanced his sure judgment of achievement in architecture and sculpture. In fact, his was the genius that enjoyed the works of artists: by exercising the cultural faculty in an apposite way, he sought to raise the ordinary at the common plane to a relatively higher plane. Viewing architecture from the tranquil surroundings of White Lodge in Richmond Park, and later from his charming retreat in Gloucestershire, he could measure the frantic desires of the modern age with accuracy. When such a man occupies the position of arbiter of taste he takes on responsibilities which are bound to arouse opposition. Yet he accomplishes much more than is generally known; he gives the outside world a fresh viewpoint and imparts a perception of style to a very wide circle. By judicious patronage he gives greater emphasis to the taste of the period which he enriches with his knowledge.

It has been my good fortune to listen to many telling debates between Lord Lee and Sir Edwin Lutyens on the merit or otherwise of certain projects submitted for consideration. Sir Edwin as an artist, criticized by a sort of instinct, which was both vivid and incisive: Lord Lee viewed the same issue in a dispassionate way, pouring oil on Lutyen's professional scorn and treating the facts as so many realistic points in favour. While these debates were in progress, what others said or thought did not appear to matter.

The issue was more often than not settled in a different way: but nevertheless it had benefited by the debate, and the fireworks.

There are two other aspects of Lord Lee's wisdom and taste which might be overlooked in a short appreciation such as this purports to be. I refer to his preferences in architecture and painting. His attitude to the former art was that of a man of culture; one seemed to recognize the amateur of the eighteenth century. His views of painting were equally Catholic and exacting. His theory was that these major arts are all embracing: having qualities in common they respond to the same generic principles and they must express the spirit of the age they represent.

With such personal gifts Lord Lee was bound to exert a restraining influence, at once wise and gratifying to his friends and colleagues. It is indeed difficult to name any patron of the arts today who has done so much to encourage taste or bridle the follies of the inexperienced. He will be remembered for his ripe judgment, for his imagination, and his irresistible honesty of outlook.

And now I lay aside my pen with reluctance, conscious of my limitations; for I must perforce leave this tribute to be amplified by someone more competent than myself. I do this all the more willingly for I am sure every member of the profession will salute the memory of one who did so much to maintain the true interest of architecture.

Ernest Whitfield Burnett [*F*], born in 1879, died in North Wales on 14 June 1947. He was trained with his father, an architect and surveyor, at Tondu, Glamorganshire and in the Windsor Estate Office, Penarth. After the death of his father in 1900 he took over the practice at Tondu. In 1910 he joined the staff of Porter and Elcock, Colwyn Bay, and a few years later became a partner in the firm, which was renamed J. M. Porter & Co. He remained at Colwyn Bay until 1940 at which time he joined the staff of the Ministry of Works in Cumberland as a quantity surveyor. In 1944 he transferred under the Ministry of Works to Rhyl, working in various areas in North Wales, Cheshire, and Lancashire, and was so employed at the date of his death.

Mr. Burnett's principal architectural works were major alterations to Penrhos College, Colwyn Bay, the erection of the assembly hall, laboratories and studies at the college, the Roman Catholic School, shops and numerous domestic undertakings in Colwyn Bay district.

H. H. G. Denvil [*L*] died on 25 June 1947, at the age of 76. He was trained at the Polytechnic, Regent Street, London, and from 1887 to 1919 was assistant to Mr. C. W. Reeves [*A*]. From 1919 to 1940 Mr. Denvil was assistant to Mr. D. P. Hayworth [*A*]. During the war years he worked in connection with air raid shelters and with war damage accounts. His last appointment was with Advance Laundries Ltd., London, and up to six weeks of his death he was actively engaged in the Estate Department on surveys and specifications of repairs. His earlier work when engaged in architects' offices was principally with domestic and industrial architecture but latterly he had been employed in work connected with factories and more particularly laundries.

Thomas Moore [*L*], known as 'the father of quantity surveying in South Africa', died on 26 April, in South Africa, at the age of 76.

He was trained in London from 1883 to 1891, and in 1891 went to Melbourne, Australia, as an assistant on a three years' engagement. He returned afterwards to London, and in 1896 commenced private practice until in 1902 Mr. Moore took up the post of Chief Quantity

Surveyor to the Public Works Department, Transvaal Colony.

In 1906 he commenced private practice in Pretoria, and up to the time of his death he was in practice there in partnership with Mr. R. F. Bell.

Harold Edgar Jarvis [*F*] of Darlington, one time a Regional Architect in the Ministry of Health, and a keen student of rural housing, practised in Darlington from 1929 to 1939. He was 56 years of age at the time of his death on 19 June 1947 and held a commission in the first world war. On demobilization in 1918 he held official appointments at Rotherham and Banbury and became Chief Architect to Messrs. Pease and Partners Ltd. Darlington where he was responsible for their Moorends Housing Estate at Thorne Colliery. In private practice before the 1939-45 war his principal architectural works were houses for Darlington and Croft local authorities and the restoration of country houses in County Durham.

From 1939-1941 he was a Civilian Garrison Engineer for the War Office and was then commissioned in the Royal Engineers, serving in the United Kingdom and later in Germany, being released from Army service in 1945. At the time of his death he was Regional Housing Architect to No. 1 Division (Newcastle) and resided at Darlington.

Alexander N. Paterson, M.A. [*Ret. F*]: The death is reported of Mr. A. N. Paterson at the age of 85. He died on 10 July 1947. He practised in Scotland and was a member of the Royal Ancient Monuments Board, Scotland, and one-time governor of the Glasgow School of Art. He was awarded the R.I.B.A. Silver Medal, 1886, the R.I.B.A. Godwin Bursary, 1896, and was once President of the R.I.A.S. He was also a Vice-President of the Glasgow Art Institute and a member of the Royal Scottish Society of Water Colour Painters.

Mr. Paterson's principal architectural works were the Liberal Club, Glasgow, Municipal buildings in various Scottish towns, the Bank of Scotland, St. Enoch Square, Glasgow, offices for Messrs. Barr and Stroud, the renovation of Yarrow Church, Selkirk, and the rebuilding of Gleddoch House in Renfrewshire. In addition, Mr. Paterson designed many war memorials after the 1914-18 war, that in the town of Helensburgh, Dumbartonshire, being one of the finest examples of Mr. Paterson's memorial work.

Percy T. Runton [*F*] died on 8 July 1947 at the age of 73. He was in partnership with Mr. J. H. Stott [*L*] at the time of his death and Mr. Stott, who will continue the practice under the name of P. T. Runton & Co. at District Bank Chambers, Bradford, has sent the following notes on Mr. Runton's career :—

Mr. Runton was responsible for a large number of buildings of a commercial nature in Hull, most of which were destroyed during the war, along with factories and private houses in that area. He was also responsible for many of the large private houses on the South Cliff at Scarborough, The Poor Law Offices, Scarborough, and extensive alterations to the Infirmary for the Board of Guardians. Mr. Runton's greatest work in the sphere of Town Planning, was the layout and construction of the Hull Garden Village Estate for Messrs. Reckitt & Sons, Ltd., comprising over 600 houses, some shops, club, village hall and Houses of Rest, the whole of the work being carried out by direct labour under control of the architect.

In the West Riding and other parts of England he was responsible for the erection and extensions to a large number of factories, chiefly of a textile nature, in which he specialized, and was responsible for the planning and erection of a large complete textile factory in Australia, undertaking all processes from raw wool to finished cloth. He also acted in an advisory capacity for the layout of factories in Australia, France, Belgium, America, South America and other countries, including power transmission, steam and power plants and textile machinery generally. He was a member of the Institute of Mechanical Engineers and a Founder Member of the Town Planning Institute.

A. W. F. Sterling [*A*], a Fellow member of the Devon and Cornwall Architectural Society, Plymouth Branch, died in Plymouth on 10 April 1947. He received his architectural training at the Architectural Association School in London, and was awarded the Diploma in 1933, in which year he was also elected an Associate of the Royal Institute. Between 1934 and 1939 he was Senior Architectural Assistant to the Borough of Heston and Isleworth during which time he designed the Isleworth Fire Station and schools in the district. He joined the Ministry of Works in 1940 and became Emergency Works Officer for Devon and Cornwall. In 1944 he became a partner in the firm of Louis de Soisson and Partners, and until his death he was engaged on new housing construction, Co-operative Housing Society Ltd. projects and on schools for the Plymouth Corporation.

Mr. Sterling's tragic death at the early age of 37 came as a shock to his fellow architects in the West country, and his keen, energetic and able personality will be sadly missed in the Devon and Cornwall Architectural Society.

Henry F. Traylen [*F*]. Many admirers of Stamford and its architectural charms will mourn the passing of Mr. Henry F. Traylen [*F*]. The preservation of the town in its ancient structural character, with its old-time associations, traditions and customs, was ever the dominant thought in his mind. The survival of Stamford's 17th and 18th century houses against the almost insatiable demands upon a town standing on the Great North Road is due mainly to the efforts of Mr. Traylen. He once said that the sight of a handcart and a few builders' tools outside any building with a 'history' was always sufficient to set him enquiring what was afoot. Few resented his 'investigations' knowing the good intentions behind them. It was an axiom of Mr. Traylen's that 'men build like angels and destroy like devils'.

This Fellow of the Royal Institute, who died at the age of 73 on 5 July 1947, has left his 'monument' in many places. All the Stamford churches and those in countless towns and villages, from St. Saviour's, York, in the north, to Chatham in the south, and Lanteglos, Cornwall, in the west, contain examples of his work.

Born at Leicester, he was educated at Stamford School, and spent five years after his school days with Messrs. Everard and Pick, of Leicester. He then spent two years in London as an expert in ecclesiastical architecture to the Admiralty, and a year as assistant to the surveyor of Windsor Castle. Returning to Stamford, Mr. Traylen went into partnership with his father, whom he succeeded as surveyor of ecclesiastical dilapidations in the Archdeaconry of Oakham, diocese of Peterborough, an office he had held for 30 years when he relinquished it two months ago, and his work has beautified many edifices in both Northamptonshire and Rutland.

In 1939 he was elected president of the Northants, Beds and Hunts Association of Architects, of which he had been vice-president for some time, and held that office for five years.

As well as earning the name of Stamford's leading archæologist and antiquary he was joint-secretary and treasurer of the Rutland Archæological Society for thirty years, local secretary of the Society of Antiquaries and to H.M. Office of Works under the Ancient Monuments Act. Mr. Traylen was awarded the R.I.B.A. Silver Star 1901 for measured drawings.

Outside his profession and its allied arts, Mr. Traylen had few interests. He was a Freemason and a keen angler. His garden, too, was an unfailing source of delight to him.

Mr. Traylen sustained a fall during the arctic weather of last winter, and the decline of his health can be dated from that incident. He leaves a widow, three sons and three daughters.

J. W. Gilmour Wilson [*F*] who designed schools at Hendon when architect to Hendon Borough Council, died on 29 May 1947 at the age of 59. He was trained in London and in 1928 entered into partnership with his father, Mr. W. G. Wilson [*F*] and they practised as W. G. Wilson and Son. As well as designing the Woodcroft, Orange Hill, Dollis and Broadfields Avenue schools at Hendon, Mr. Wilson was responsible for a number of houses and office premises in Greater London and for the restoration of the Hendon Parish Church of St. Mary's and the modernization of St. Mary's Church of England School at Hendon–one of his outstanding conversion works.

Upon the retirement of his father in 1935 Mr. J. W. G. Wilson carried on the practice of W. G. Wilson and Son and was in practice at the time of his death.

Membership Lists

ELECTION: 8 JULY 1947

The following candidates for membership were elected on 8 July 1947.

AS FELLOWS (6)

Brandt: Jack Bernard, M.T.P.I. [*A* 1933], Southampton.
Butler: Bertram [*A* 1922], Wolverhampton.
Hiorns: Percival Theodore [*A* 1921].
Honeyman: James Maclaren, Dip. Arch. (Glasgow) [*A* 1919], Glasgow.

And the following Licentiates who are qualified under Section IV, Clause 4 (*c*) (ii) of the Supplemental Charter of 1925:—

Jury: Sydney Charles, Bedford.
White: Richard Wakeham.

AS ASSOCIATES (23)

Allsopp: John Edward, Hurlstone Park, New South Wales.
Ansell: Harry Benson.
Benjamin: Joshua Moses, Bombay.
Bhuta: Vanu Gopalji, Bombay.
Cunningham: William Paul.
Davison: Philip Leonard, Sheffield.
Gray: James Ian Scott, South Shields.
Holloway: Sidney Malvern, Huntingdon.
Katona: Ervin.
Kent: Peter, Nairobi.
Lewis: Eluned (Miss), Sale.
Lovell: Guy Tasman, Neutral Bay, Sydney.
Murphy: Dermot Barry, Cremorne Point, Sydney.
Nilgiria: Jamshed Cowasjee, Colombo.
O'Callaghan: James Oliver Plunkett, B.Arch., Dundalk, Eire.
Patil: Arvind Shankerrao, Bombay.
Payne: Sylvia Mary (Miss).
Pinshow: David, Johannesburg.
Pollock: John Gathorne Montagu, Denver, Colorado, U.S.A.
Smith: John Michael Austin, M.C.
Sturt: Anthony Napier, Painswick, Glos.
Whitelaw: Alexander Robertson, Thornliebank, Renfrewshire.
Young: Frank William.

AS LICENTIATES (22)

Blennerhassett: Francis Thomas, O.B.E. (Lieut.-Col.), Birmingham.
Bouch: James Albert, Hull.
Brown: Edward.
Challis: Frederick Edward Sewell.
Chapman: John Frank, F.S.I.
Chappel: Sidney William.
Cochrane: Hugh Frederick.
Deedman: Eric Alfred.
Foster: Ivor George.
Hudson: Henry Rowland, Leeds.
Jelinek-Karl: Rudolph.
Land-Reeves: Geoffrey.
Levi: Jestyn Ieuan, Pontardawe.
Margot: Charles Edward.
Marriner: Eric Montagu, Birmingham.
Nunweek: Robert Wyndham, Sheffield.
Savage: Cecil Henry, Birmingham.
Sharp: Harold William.
Targett: Cyril Henry.
Wheal: Isaac Alfred Howard.
Wood: John Henry, P.A.S.I., Shrewsbury.
Woodrow: Thomas Edward.

ELECTION: 14 OCTOBER 1947

An election of candidates for membership will take place on 14 October 1947. The names and addresses of the candidates, with the names of their proposers, found by the Council to be eligible and qualified in accordance with the Charter and Bye-laws, are herewith published for the information of members. Notice of any objection or any other communication respecting them must be sent to the Secretary, R.I.B.A., not later than Saturday 6 September 1947.

The names following the applicant's address are those of his proposers.

2nd LIST

AS FELLOWS (5)

Coombes: Robert Edwin Montagu, J.P. [*A* 1926], Heslam Chambers, 191 High Street, Lincoln; 'Norland', Church Lane, Lincoln. F. A. Broadhead. E. W. Pedley and C. F. W. Haseldine.

Hill: Frederick Alexander Rowland, A.M.T.P.I. [*A* 1940], 80 Bromsgrove Road, Redditch. G. C. Gadd, L. C. Lomas and G. D. G. Hake.

Mathews: Edmund Douglass Jefferiss, O.B.E. [*A* 1939], 3 Ebury Street, S.W.1; The Old House, Blechingley, Surrey. Sydney Tatchell, Darcy Braddell and O. D. Pearce.

Soden: Armand Wilmshurst [*A* 1934], 38 Frognal Court, Finchley Road, N.W.3. J. B. Surman, A. F. Benjamin and Harold Dicksee.

Walkden: John Stanley, Dist.T.P., M.T.P.I. [*A* 1929], School of Architecture, Surveying and Building, The Polytechnic, Regent Street, W.1; 58 Oakwood Avenue, Beckenham. Sydney Tatchell, Prof. L. B. Budden and Anthony Minoprio.

AS ASSOCIATES (35)

The name of a school or schools after a candidate's name indicates the passing of a recognized course.

Barry: Robin Lewis [Final], 53a Peak Hill, S.E.26. Douglas Wood, E. B. O'Rorke and J. D. Wood.

Bates: Sidney Henry [Final], 'Fairacres', Colville Road, High Wycombe. G. R. Hutton, H. W. Smith and L. J. Ashby.

Battiscombe: John Henry (Arch.) Assoc. (London): Sch. of Arch.), 'Thrums', Epsom Road, Ewell, Surrey. E. B. O'Rorke, L. H. Bucknell and R. E. Enthoven.

Beasley: Michael David (Arch. Assoc. (London): Sch. of Arch.), 66 Frognal, N.W.3. H. G. Goddard, L. H. Bucknell and R. F. Jordan.

Bender: Holwell Charles Courtney (The Poly., Regent Street, London: Sch. of Arch.), St. Mary's Vicarage, Stamford Brook, W.6. E. C. Scherrer, J. K. Hicks and Miss J. B. Drew.

Beresford: Jack [Special Final], 145 The Grove, Wheatley Hill, Doncaster. H. A. Hickson, Morris Thompson and L. S. Stanley.

Chapman: Charles William Ernest [Special Final], 16 Slades Close, Enfield, Middlesex. T. E. Scott, J. T. W. Peat and H. B. Challen.

Cordwell, John Donald (Arch. Assoc. (London): Sch of Arch.), 284 Lewisham High Street, S.E.13. A. T. Scott, Edward Playne and L. H. Bucknell.

Cousins: James Sydney [Final], 54a Belsize Park Gardens, Hampstead, N.W.3. J. A. Dempster, C. Kemp and Donald Jack.

Cross: Elizabeth Mary (Miss) (The Poly., Regent Street, London: Sch. of Arch.), 52 Heston Road, Hounslow, Middlesex. W. E. Cross, W. C. Green and Sir Giles Scott.

Curry: Harold Wathen (Nottingham Sch. of Arch.), 7 Pennine Road, Sugar Lane, Dewsbury. Hubert Bennett, George Checkley and G. E. Burgess.

Farmer: Joan (Miss) (The Poly., Regent Street, London: Sch. of Arch.), 9 Wickham Road, Brockley, S.E.4. E. C. Scherrer, J. K. Hicks and Raglan Squire.

Fisher: Carl (The Poly., Regent Street, London: Sch. of Arch.), 15 Addisland Court, Holland Park, W.14. E. C. Scherrer, J. K. Hicks and Edward Playne.

Fowkes: Eric Stuart [Final], Magdala House, Beverley, E. Yorks. P. M. Newton, F. J. Horth and H. E. Horth.

Godfrey: Eleanor (Miss) (Arch. Assoc. (London): Sch. of Arch.), 27 Egerton Terrace, S.W.3. Christopher Nicholson, Frederick Gibberd and A. M. Chitty.

Gordon: Harold John (The Poly., Regent Street, London: Sch. of Arch.), 17, Gayton Road, Hampstead, N.W.3. E. C. Scherrer, J. K. Hicks and C. B. Willcocks.

Hawkins: Francis Fred [Final], 2 St. George's Flats, The Marina, Boscombe. R. A. Phillips, W. H. Mackenzie and A. E. Geens.

Herriott: James Morris [Final], 12 St. Andrews Close, Thorpe St. Andrew, Norwich. A. G. Berry, S. J. Wearing and E. W. B. Scott.

Herrmann: Fritz Heinrich Joseph [Special Final], 4 North Square, N.W.11. H. Lidbetter, Stanley Hamp and L. S. Stanley.

Lomas: Charles Anthony [Final], 85 Osidge Lane, Southgate, N.14. E. A. Chilton, J. T. W. Peat and F. C. Benz.

McGegan: James Edward Peter (Edin. Coll. of Art: Sch. of Arch.), 57 Kilravock Street, W.10. Bertram Carter, Sir Frank Mears and Cecil Masey.

MacLaurin: Ian Graeme (Arch. Assoc. (London): Sch. of Arch.), Church Green Cottage, Farringdon, Alton, Hants. David Stokes, R. F. Jordan and L. H. Bucknell.

Maltby: Selina Rosemary (Miss) (Arch. Assoc. (London): Sch. of Arch.), 5b Kensington Church Street, W.8. Miss J. B. Drew, E. M. Fry and Christopher Nicholson.

Marshall: Roger Herbert Percival (Arch. Assoc. (London): Sch. of Arch.), 67 Kingsbridge Road, Norwood Green, Southall. R. F. Jordan, R. E. Enthoven and H. G. Goddard.

Matthews: Gordon Edwin [Special Final], 8 Meads Street, Eastbourne. Applying for nomination by the Council under Bye-law 3 (*d*).

Mitchell: Ronald Henry [Special Final], 215 Barnsole Road, Gillingham, Kent. W. A. Rutter, P. A. W. Roffey and A. W. Reading.

Page: Robert [Final], 'Withey Grove', Stoke St. Gregory, Taunton. R. O. Harris, S. H. Loweth and Richard Mellor.

Robson: Christopher Elic [Final], 21 Moran Street, Fulwell, Sunderland. S. W. Milburn, G. T. Brown and W. B. Edwards.

Slater: John Moore [Special Final], 22, Gombards, St. Albans, Herts. Applying for nomination by the Council under Bye-law 3 (*d*).

Taylor: John Drury Meade, M.A.Cantab. (Arch. Assoc. (London): Sch. of Arch.), 3 Tower Gardens, Hythe, Kent. R. F. Jordan, L. H. Bucknell and R. E. Enthoven.

Taylor: Ronald (The Poly., Regent Street, London: Sch. of Arch.). 'By-the-Way', Highdown Way, Ferring, Nr. Worthing. E. C. Scherrer, J. K. Hicks and A. W. Harwood.

Tyler: Richard Michael Townsend [Special Final], 46 Cranley Gardens, S.W.7. G. D. G. Hake, J. M. Easton and Howard Robertson.

Ward: Bernard Valentine [Final], Flat 2a, Mayfare Buildings, Victoria Road South, Southsea. J. V. Nisbet, V. G. Cogswell and A. C. Townsend.

Warren: Bernard Francis [Final], 184a Psalter Lane, Sheffield, 11. W. G. Davies, F. W. C. Gregory and Stephen Welsh.

Wright: Edward Stephen [Final], 'Caversham', Chalkwell Road, Sittingbourne. Norman Keep, C. G. Stillman and applying for nomination by the Council under Bye-law 3 (*d*).

AS LICENTIATES (10)

Brooke: John Henry, Chief Scientific Advisers Division, Ministry of Works, 57 Onslow Gardens, South Kensington, S.W.7; 53 Green Lane, Edgware, Middlesex. Applying for nomination by the Council under Bye-law 3 (*d*).

Brooksbank: Frank James Frederick, 33 Eastern Road, Romford, Essex; 19 Hainault Road, Romford. Wm. Evans, Edward Meredith and J. J. Crowe.

Francis: John Henry Melville, National Provincial Bank, Ltd., Architects Dept., 15 Bishopsgate, E.C.2; 34 Burgh Wood, Banstead, Surrey. W. F. C. Holden, B. Sherren and Henry Aitken.

Gomershall: Ronald, c/o F. Vaux, Esq. [*F*], 31 Quay Road, Bridlington; 30, Trinity Road, Bridlington. F. Vaux, P. M. Newton and C. W. C. Needham.

Hannen: Cecil May, 9 Victoria Street, Westminster, S.W.1; Kemp's Farm House, Buckland, Betchworth, Surrey. T. Rayson, W. A. Forsyth and H. Lidbetter.

Hawks: Claude, War Damage Commission, 147 Leadenhall Street, E.C.3; 298 Well Hall Road, Eltham, S.E.9. Robert Cromie, R. K. Ellison and applying for nomination by the Council under Bye-law 3 (*d*).

Last: Leonard William, 93 Long Acre, W.C.2; 63 Clonmel Road, Teddington, Middlesex. Guy Church, S. T. Hennell and Oliver Law.

Lee: Frederick Cecil, c/o Messrs. Wood, Goldstraw & Yorath, Victoria Chambers, Tunstall, Stoke-on-Trent; 32 Eleanor Crescent, Newcastle, Staffs. Applying for nomination by the Council under Bye-law 3 (*d*).

Smale: William George, P.A.S.I., Assistant Architect, Ministry of Works, Cornwall Terrace, Regent's Park, N.W.1; 72 Ashness Gardens, Sudbury Town, Greenford, Middlesex. V. L. Nash, C. H. Stableford and applying for nomination by the Council under Bye-law 3 (*d*).

Vicary: Frederic Leslie (Capt., R.E.), The War Office, Room 231, Metropole Buildings, Northumberland Avenue, W.C.2; 11 Norval Road, North Wembley, Middlesex. Applying for nomination by the Council under Bye-law 3 (*d*).

ELECTION: 9 DECEMBER 1947

An election of candidates for membership will take place on 9 December 1947. The names and addresses of the overseas candidates, with the names of their proposers, are herewith published for the information of members. Notice of any objection or any other communication respecting them must be sent to the Secretary, R.I.B.A., not later than Saturday 22 November 1947.

The names following the applicant's address are those of his proposers.

AS FELLOW (1)

Allen: Alfred Maxwell [*A* 1926], 103 Salisbury House, Smith Street, Durban, South Africa. Howard Robertson, J. M. Easton and E. G. Allen.

AS ASSOCIATES (2)

Gilbert: Bertram Hiller (Passed a qualifying Exam. approved by the I.S.A.A.), Nelston, Newlands Road, Claremont, Cape, South Africa. D. R. Harper, C. P. Walgate and Prof. L. W. T. White.

Jenks: Alan Seymour, B.Arch. (Rand) (Passed a qualifying Exam. approved by the I.S.A.A.), 64, Boundary Road, Talboton, Johannesburg, South Africa. Robert Howden and applying for nomination by the Council under Bye-law 3 (*d*).

Members' Column

This column is reserved for notices of changes of address, partnership and partnerships vacant or wanted, practices for sale or wanted, office accommodation, and personal notices other than for posts wanted as salaried assistants for which the Institute's Employment Register is maintained.

APPOINTMENTS

Mr. V. Brown [*A*] has been appointed Deputy to the County Architect, Herefordshire County Council. His private address is 35, Kings Acre Road, Hereford.

Mr. C. J. Burnett [*F*] has been appointed Council Architect to the Metropolitan Borough of Bermondsey and will be pleased to receive trade catalogues, etc., addressed to Council Architect's Department, Housing and Estate Offices, Neckinger Street, Bermondsey, S.E.1.

Mr. A. E. Dowsey [*A*], formerly Chief Assistant Architect, County Borough of Great Yarmouth, has been appointed Architect and Consultant to the Twenty First Century Corporation Limited of Nassau, The Bahamas, British West Indies. He will be pleased to receive trade catalogues, etc., at his London office, 2-3, Norfolk Street, Strand, London, W.C.2.

Mr. Robert F. Fairhurst [*A*], at present Chief Assistant Architect in the City Architect's Department, Exeter, has been appointed Deputy Borough Architect, County Borough of Bournemouth.

Mr. W. Porter Mitchell [*A*] has been appointed Chief Assistant Architect to the County Borough of Dewsbury. All future communications, trade catalogues, etc., should be addressed to him at Borough Architect's Office, Dewsbury, and *not* to the City Architect's Office, Leeds.

Mr. R. D. Wormald [*A*] has been appointed Chief Architectural Assistant to the City Engineer of Wakefield. His private address is 11, Sherwood Grove, Lupset, Wakefield, and he will be pleased to receive trade catalogues, etc.

PRACTICES AND PARTNERSHIPS

Elderly member desires younger partner for well-established practice in small Somerset town. Reply Box 74, c/o Secretary, R.I.B.A.

Mr. W. Elsworth [*A*], having terminated his appointment with the Durham County Education authority, has taken over the Shrewsbury practice of **Shayler, Butler** and **Dilkes,** carried on by the late Mr. C. G. Butler at Dana Chambers, Castle Gates, Shrewsbury (Shrewsbury 2803), and will be pleased to receive trade catalogues, etc.

Mr. C. Entwistle [*L*] will be pleased to receive all makers' trade catalogues, etc., and physical characteristics sheets, at 35, Royal Avenue, London, S.W.3 (Sloane 3535).

Mr. Cecil C. Handisyde [*A*] has reopened his practice in London at 4, Ridgmount Street, W.C.1 (Museum 9906), and will be pleased to receive trade catalogues, etc.

Mr. Denis Rawnsley Harper [*A*], who has recently had conferred on him the degree of Doctor of Philosophy by the University of Cape Town, announces that his address is Department of Architecture ,University of Cape Town, South Africa (Cape Town 62887). He is returning to the U.K. on furlough in December next.

Mr. R. C. A. Lee (late Capt. R.E.) [*L*], late of the Denbighshire County Council, has now commenced private practice under the name of **R. Cresswell A. Lee,** at County Court Buildings, Egerton Street, Wrexham (Wrexham 2835), and will be pleased to receive trade catalogues, etc.

Messrs. Nightingale and Ambrose [*F*/*F*] have opened a branch office at 107, Elm Grove, Southsea (Portsmouth 74222).

Mr. Frederick T. Orman [*F*] and **Mr. Alan D. Scott** [*A*] have entered into partnership and are now practising under the style of **Orman and Scott** [*F*/*A*], at Quarry Hill House, Quarry Street, Guildford (Guildford 5024), and temporarily from 5, Cumberland Place, Southampton (Southampton 2438), until permanent accommodation is ready, the address of which will be notified.

Mr. H. E. M. Price [*A*] announces his permanent address as "Mount Edgely," Tennant Road, Wynberg, Cape Town, S. Africa.

Mr. J. W. Rivett [*A*], of 401, Collins Street, Melbourne, Australia, returned to practice in June, 1946.

CHANGES OF ADDRESS

Mr. G. E. Bright [*F*], of 28, Great Castle Street, Oxford Circus, London, W.1, has had his telephone number changed from Mayfair 4761 to Mayfair 1783/4. His private number, Enfield 1416, remains unchanged.

Mr. E. Curnow Cooke [*L*] has removed to 24, Southernhay East, Exeter (Exeter 2606), and will be pleased to receive trade catalogues, etc.

Mr. Graham G. Cooke [*A*] has removed to 13, Farnborough Road, Birkdale, Southport, Lancs.

Mr. T. F. Ingram [*F*] has removed to 88-89, Gracechurch Street, London, E.C.3 (Mansion House 9193).

Mr. Howard Lobb [*F*] announces that the address of his Cowes, I.O.W. office, has been changed to 16, Bath Road, Cowes, I.O.W. (Cowes 291). Mr. Lobb will be pleased to receive trade catalogues, etc., at this address, particularly those relating to housing and industrial work.

Mr. A. W. J. Mullins [*L*] has removed to "Selwyn House," 78, Thoro'fare, Woodbridge, Suffolk (Woodbridge 544), and will be pleased to receive trade catalogues, etc.

Mr. Cecil Stewart [*A*] has removed to 9, Barkeley Mansions, Fielden Park, Manchester, 20 (Didsbury 3636).

Mr. Wilfrid G. Wright [*A*] has removed from 8, Peacock Lane, Leicester, to 138, New Walk, Leicester (near University Road) (Leicester 21596, Extension 2). The telephone number is a temporary arrangement until a permanent line is established.

PRACTICES AND PARTNERSHIPS WANTED AND AVAILABLE

Associate (31) desires partnership, or position leading thereto, in country practice in East Anglia or the West Country. Reply Box 73, c/o Secretary, R.I.B.A.

Practice in Midlands County town for sale. Going concern with State-aided Housing contracts with local authority. Excellent offices, low overheads. Reply Box 71, c/o Secretary, R.I.B.A.

Partnership for sale in old-established London practice. Reply Box 72, c/o Secretary R.I.B.A.

WANTED AND FOR SALE

For sale, dumpy level by Winter (Newcastle-on-Tyne), 12-inch, 4 screws, Stadia points tripod, £30; Sopwith Staff, 14 ft., £5; chains, 66 ft., 100 ft., £2; steel band, 100 ft., £3; two drawing boards, 42 x 27, £4; two T-squares, £4; surveying compass and clinometer, £10; optical square, £1. May be seen near Leeds. Reply Box 75, c/o Secretary, R.I.B.A.

For sale. The following books in new condition: Law Relating to Building and Engineering Contracts, 1940 (Cresswell), 15*s.*; Towns and Town Planning (Hughes and Lambourn), 15*s.*; Development of Private Building Estates, 2nd edition (Howkins), 18*s.* 6*d.*; Heating and Air Conditioning of Buildings, 1936 (Faber and Kell), 25*s.*; Drainage and Sanitation, 1936 (Blake), 11*s.* 6*d.* Reply Box 76, c/o Secretary, R.I.B.A.

"A.B.S"

House-Purchase Loans

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1. **Normal Advance:** 80 per cent. of valuation. **Interest:** 4 per cent. gross. (Borrower pays Survey Fee and Legal Costs, totalling 1½ per cent. of loan.)

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Repayment by means of an Endowment Assurance term not exceeding 25 years under (1) or 30 years under (2).

Particulars from: The Secretary, A.B.S. Insurance Department, 66, Portland Place, London, W.1. (Tel.: WELbeck 5721.)